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Extracts from Chordal's Letters.

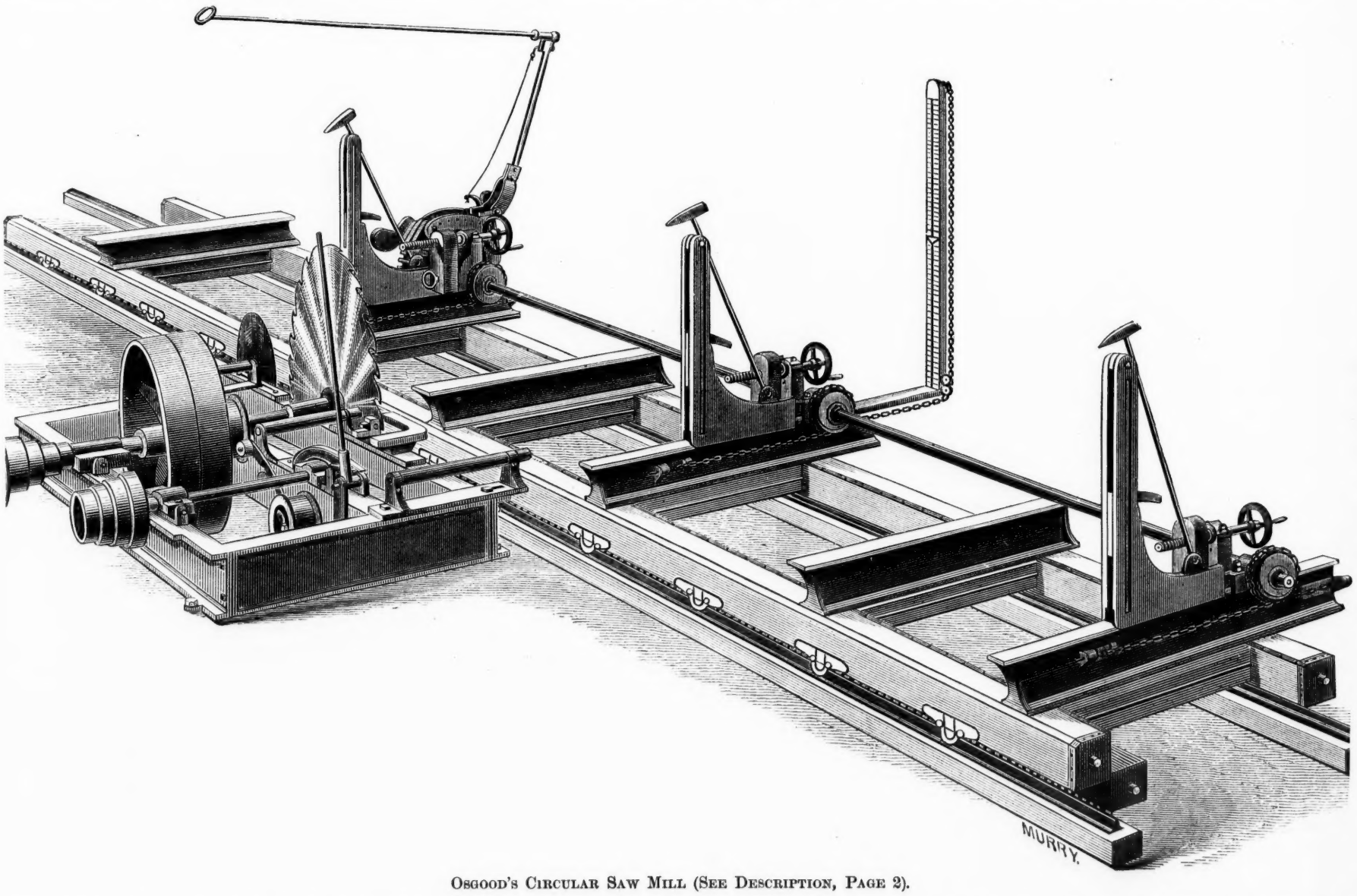
Mr. Editor :

* * * * Some years ago—a good many happily—if a man happened to have a line shaft and found that his steam gauge must show twenty pounds before he could revolve the shaft, he thought little of it. When he put up the building he put up the clumsy shaft with its common boxes bolted squarely up against posts. The shaft was put up in line, and if it staid so, well and good, and if it didn't stay so, well and good. But in course of time people began to reduce the diameters of shafts and to increase their velocities, and in course of time it got so a man could revolve a long line shaft by hand, and finally the art improved to that state which requires a shaft in each nice shape that the merest trifle of force will turn it. Such a result is attained by making the shaft round, and straight and small; by making pulleys light and in balance; and by making bearings in good style and in perfect line. It is immaterial what the form of the bearing is so long as its wearing surface is in proper shape, and its bore in line with its neighbors. Experience with shafting developed the fact that it was easy to make a good box, but very difficult to get it into line if of ordinary bolted box form, and that settling floors, etc., would soon disarrange all the fine adjustments. The first step towards a nicer device was to arrange the boxes in a holder so that the proper adjustment could be made by set screws. This rendered erection an easy matter, and allowed the boxes to be brought into general line, but it failed to provide for bringing every part of every box into collimation. That is, a true line might cut the axis of every box at some point of the box's length, but there was nothing to prevent the axis of each box assuming independent angles. The adjustment provided consisted of vertical and horizontal movements by screws, and the fault above referred to was obviated by designing the box in gimbal form, so that each box was universally self-adjusting, as far as its individual axis was concerned. Such boxes or hangers could be put up in a position of approximate accuracy, and then brought into line by means of the vertical and horizontal adjusting screws, great care being taken to deal with the axis of the box at the center of its length, or point of gimballing action. That being done the balance of the box's length would attend to itself.

Such hangers have never been improved upon, and probably never will be. They contain erective and corrective adjustments and self-adjusting features, as far as attainable. But along with the universal hanger has come the idea that they are self-adjusting and may be put up recklessly. This is a grand mistake, for, while the universal movement will generally prevent corner or "cant" wear, it does not, in the least reduce the general ill effects of general bad alignment, and there is no justification for putting such hangers up in bad shape, and no justification for omitting any of the facilities for adjustment. Some makers have adopted the ball-and-socket hanger on account of its peculiarly solid form, simplicity of structure and low cost, and it is often copied under the impression that it possesses all the virtues of the old gimbal hanger. When the ball-and-socket hanger is up, and in line, it is the real equivalent of the gimbal hanger, but it lacks an important feature of convenience in erection and readjustment. The horizontal adjusting movement is omitted altogether, and a substitute found in sledge-hammer manipulations.

* * * * Speaking of line shafts : The Colt's Fire Arms Co., of Hartford, have something peculiar in the way of line shafts. There are many lines of many hundred feet, and all the shafts are twelve inches in diameter. The idea is to use no pulleys, but to run the belts directly upon the shaft. The speed of driven devices are arranged by using proper sized receiving pulleys. The shaft is of cast iron, very light, and is reduced to four inches at the bearings, which are about twelve feet apart. The shaft or drum is made in sections, each having an internal flange at each end. Each journal is in spool form—that is, it has a flange at each end, and these journal flanges are bolted to the drum flanges. There are no elastic features introduced, the whole being as rigid as possible. Where motion is transmitted from one line to another, pulleys are used, the hubs being bored to fit the drum, the same as if it was of the usual size. A pair of vertical engines drives the initial shaft, and the line shaft is caused to act as the crank-shaft of the engines. Crank discs are placed on the ends of the line shaft, and receive motion directly from the engines. A line shaft, large enough to act as a driving-pulley, will be a new idea to many, and will be apt at once to suggest criticism. It is evident that excellent intentions will sometimes fail, and that time will see many odd-sized pulleys strung upon this drum. Such pulleys might be called lagging. We, who are used to putting a belt on a dead pulley and then on the live one, will wonder how they get along without the privilege.

* * * Tell Prof. Sweet that Chordal's whole aim is to make cheap work better and good work cheaper, and that, in the discussion of questions tending to interest the craft in any way, Chordal fails in his mission if he, by any wrong impression, deters criticism or discussion. Fallacy will often arouse thought in the thoughtless, and motives must be looked into before expression is condemned. Many technical writers glory more in personal victory than in good accomplished,



OSGOOD'S CIRCULAR SAW MILL (SEE DESCRIPTION, PAGE 2).

seeming to think it better that personal views should be maintained than that proper conclusions be reached. Chordal has not yet been retained as counsel for bigotry, and will not be. His views are intended to provoke criticism and discussion for the benefit of your readers, and if any word of mine tends to bring two words from Prof. Sweet, my labors will have accomplished some good I know. I hope that in criticising Chordal's views, or assertions rather, Chordal, himself, will not be criticised.

* * * * Can you imagine the enthusiastic artist admiring the rare creations of the masters, always alive to their points of excellence, and ever striving to give his own atmosphere the color of their bold superiority? And can you imagine the rare delight this artist would find in that reversal of time which would allow him to touch these masters and see them at their work. If you can you know something of Chordal's experience as he makes his first pilgrimage, and sets foot in the sacred premises of Sellers, Brown and Sharpe, Pratt & Whitney, Corliss, &c., and finds himself in contact with the men whose names have been always by him through his shop life.

I did do it, sure enough. I put on my summer hat, stopped the mill, and made the grand rounds. I never saw these shops before, and for that reason am glad I didn't die last summer. If I should commence to make what I saw and was interested in the subject of these letters, I wouldn't have time to write them, and the A. M. wouldn't be big enough to hold them, so I won't do it. * * *

Yours respectfully,

CHORDAL.

Osgood's Circular Saw Mill.

Among the most important machines contributing to the development of a sparsely settled territory is the circular saw mill. In the wooded districts of our country, from Maine to Oregon, it performs a prominent part in industrial enterprise. Osgood's Patent Circular Saw Mill, shown by an engraving herewith, is the result of over twenty years' practical experience in the use and manufacture of sawing machinery, and has gained considerable celebrity. One of its most valuable features is the set-works, which is about the most important part of a saw mill, on the reliability and efficiency of which depends, in a large degree, the financial success of lumber producing. If the lumber is poorly sawn, there is not only a waste of time and material in the saw mill, but an inferior price must be accepted in the market, besides which, there is a waste of time and material in dressing, either by hand or machinery.

While the set works of all good mills will perform accurately, when they are new, yet very soon "lost motion" is produced by the ordinary wear of the parts, and lumber of an inferior quality is made until a renewal of the worn parts can be accomplished, either by procuring duplicate pieces from the manufacturer of the mill, or by resort to the nearest machine shop.

The importance of having sawing machinery that will stand rough usage without getting out of order, was aptly illustrated by a paragraph in one of Chordal's Letters, in a recent issue:

"Among the saw mills in this region could be found many triumphs of unlettered genius. There were few real mechanics in these mills, shops hundreds of miles away by wagon road, and accidents always happening. The stop-valve on the engine gives out, but the mill must run while a new one is coming. A brake is put under the fly-wheel to slow the engine, and a stick of cord-wood thrown under the connecting rod stops it. Rod boxes and cross-head "brasses" of oak were common. A slide-valve of black walnut was found once in a while. Oil gives out and water is used till a hog is killed. The saw gets sprung, and the factory wants thirty dollars to exercise the saw maker's magic art upon it, and the mill would stand still three weeks. The backwoods' sawyer straightens it in an hour, without knowing just how he did it."

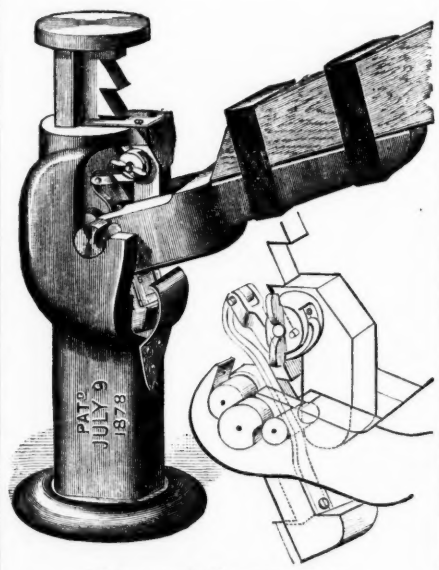
It is claimed that with this mill the sawyer can, in a few minutes, with a screw wrench, take up all the wear and lost motion, making the set as accurate as when it was new.

This it is claimed can be done at any time, no matter how old or badly worn the mill may be. In the event of a breakage of this arrangement any one can repair it in a few minutes so it will work accurately as before. There is nothing complicated about this sawing machine. It saws logs long or short, hard wood or soft wood. The frame is made either of wood or iron, as preferred.

All of the main bearings are provided with self-oiling boxes; and the carriage is protected with iron on the edges and ends of each section, and runs on half-oiling wheels. The log is run ahead and back, by one lever actuating friction wheels, with positive parallel motion. Three changes of feed are provided for in the cone pulleys; these, or the main driving pulley, may be placed either inside or outside the frame, by the purchaser. Heavy iron, A, and flat track is provided for the carriage to run on.

The Sawyer has full control of the "Set works," and of the movement of the carriage without moving from one position. It requires from one to three men less to operate this mill than some of the common style of mill.

A "standing rule," with automatic index, is placed at back end of the middle head block, where it is easily read by the sawyer, and cannot get covered with dust.



HOWLAND'S LIFTING JACK.

Each head block is provided also with an independent screw set, by which it may be "set" to accommodate a "taper log." There are, besides the usual "dog," a "sliding dog" fitted to each head block, to hold the "last board."

There is also provided an adjustable "pin stop," for the "set works," which is very useful when the log is to be sawed up into one thickness; with this device the sawyer, without looking at the rule pulls on the "set lever," until a pawl stops against this pin, and gives, accurately, the desired thickness. This "set" will work accurately to saw boards of any thickness, from the 1-16th of an inch upwards.

Further particulars will be furnished when desired by Edward P. Hampson, 91 Liberty St., New York, where the mill may be seen.

Howland's Improved Lifting Jack.

Our illustration represents a lifting jack combining cheapness, power and efficiency. The principal work to which this jack is adapted is for raising cars or any other work where a jack is required. It has been designed to do the work of more expensive and complicated jacks, and at the same time in the hands of the trackman, truckman, or laborer of ordinary intelligence, is claimed to be always ready, powerful, safe and quick. It lifts with both upward and downward stroke of the lever, therefore no time or motion is lost, and having twice as great leverage as is possible where the lifting is done with the downward stroke alone. By its peculiar construction, the power is applied so directly as almost entirely to avoid friction. The weight cannot possibly fall while the jack is under it, as neither pawl can be disengaged while the weight is taken by the other.

It lowers the weight automatically, by the same movement of the lever that raises it, and without manipulation of springs or pawls. It is simple, having no delicate adjustments, hence does not require a machinist to keep it in working order. Is claimed to work equally well in any position. The working parts are made of cast steel to ensure strength and durability. To work the jack, in raising the thumb-nut, shown in the cut, it must be turned to the left so as to draw the pawls inward against the ratchet.

To lower the thumb-nut it must be turned to the right, so as to push the pawls away from the ratchet, care being observed to turn the thumb-nut all the way around until it meets the stop, as it will not lock unless carried beyond its center. It is best to work the lever slowly until familiar with its use.

The height of this jack is 11½", will raise 6", weight 23 lbs. and capacity 4 tons. It is now being introduced by W. C. Duyckinck, general agent, 50 and 52 John St., New York.

Eclipse Lace Cutter.

The small tool which is shown in the accompanying illustration is new to this market, and is to be used to cut belt lacings. It is claimed to cut accurately and is easily managed. The knife edge is placed so as to run in a groove cut in the face of a small brass wheel, which in turning allows the lacing to pass more easily over the edge of the knife. The small projection on the casting under the knife prevents it from being pushed out of place by the pressure brought upon it when a heavy lace is being cut, which is an objection to some lace cutters now in use.

The operation of the instrument is as follows: Adjust the gauge to the width of the lace required; place the loop of the device on the second or third finger of the right hand, and the thumb on the feed roller. With the left hand insert a corner of the leather under the roller above the knife, and press it forward; if the leather is very soft, or extremely hard, aid it by slightly turning the feed roller with the thumb. As soon as a small portion is thus cut, any desired length may be readily pulled through. To cut good parallel laces, care must be taken to keep the leather against the gauge. F. S. Van Vleck, 102 Chambers Street, has taken the agency for the Eclipse Lace Cutters and is introducing them.

Use of Lubricants.

BY L. F. LYNE, M. E.

No. I.

It is astonishing to observe to what an amazing extent the manufacturing community are deceived in relation to lubricants. For instance, a traveling agent, representing some new oil company, enters a shop and exhibits his samples (which are most always of the very best) and solicits of the proper authority a trial of his lubricant.

These trials are offered on very liberal terms and are generally granted, in most cases resulting successfully and ending in an order for one or more barrels. The first barrel is, of course, the best, fully agreeing with the samples, is generally liked, and preparations are accordingly made to adopt the new lubricant, which in most cases requires a special cup or feeding apparatus. If this adoption be on a railroad it is necessarily attended by a large expense. All goes well until the lubricant is completely adopted. The writer, on one occasion, had his attention directed to a new lubricant with a request to try it; accordingly a new cup was placed on the crank pin bearing of the main rod of a stationary engine 18"x36". The cup was filled with the lubricator, and time noted. It ran six months, when it was again filled and again ran six months, two cupfuls lasting one year. These were, indeed, very excellent results, so an order was given and the lubricant was adopted without delay. The second supply was evidently a little inferior to the first, but no complaints were made; the third was still a little poorer, and so it followed until the quality was lowered to the extent that a cupful would last only one week, and sometimes not even as long as that. It is, perhaps, unnecessary to add that the company returned to the original plan of lubrication. What is true in the foregoing example is true in the majority of cases, and there are few oil concerns who will furnish a uniform grade of oil without constant watching and an occasional reprimand. The writer is acquainted with a chemist, who, it is said, has saved ten thousand dollars for his company in one year by the analysis and rejection of bad lubricants.

In reference to getting over the foregoing difficulties I would simply say, "*Deal only with men that have an established reputation, and who will not sell their honor for dollars and cents.*"

Most men will buy a lubricant because it is cheap, regardless of its chemical composition. So long as the shafting will run without squeaking so badly as to drive customers away in disgust, the lubricant is considered good enough. The extra power required to drive the shafting and tools is never thought of, and if an expert should advise the application of an indicator to the engine to show the "true results," the idea is ridiculed, and the expert is frequently told that the indicator and its diagrams are all a confounded humbug. Why, I know a man whose mechanical engineer told him that the amount of fuel used in one day to run his factory ought to last a week; the proprietor scoffed at the announcement, and finally an indicator was applied to the cylinder and some cards taken, which bore little or no resemblance to a perfect diagram, for the area of the card taken from one end of the cylinder was more than double that taken from

the other end. The M. E. then told the proprietor that he would be pleased to make the necessary alterations at his own expense, for a consideration of one-half the fuel that would be saved. Suffice it to say that the alterations were never made, and the engine is still thumping away with a blacksmith's helper as engineer, who divides up his time between the anvil and engine. The writer, on one occasion, saw a large powerful drill press, running with the back gear in, suddenly stop, after which it was found impossible to start it. With much trouble it was taken apart. To the surprise of every one, the journals were not destroyed, but the residue of the lubricant was like a mass of glue. Some kerosene oil was brought into requisition, the machine cleaned, and after being put together was again started, and in a short time the same thing occurred again Still the oil was not condemned. The writer has frequently seen a lathe, when first started up in the morning, show barely sufficient power to run itself, aside from any work. When any one remonstrates, the proprietor says, "We are running very economically now, and cannot afford to use sperm oil," forgetting, at the same time, that he is throwing many times the price of the best oil into the furnace in the shape of fuel, while the bearings on the shafting and all the tools are rapidly wearing away, so that in a short time frequent repairs become necessary. We are often led to exclaim: "Why are men so pig-headed that they will not see the errors of this false economy, which, in reality, means extravagance?" There are always two sides to economy. It frequently occurs that new taps and dies are ruined by using poor oil, for it is generally supposed that the poorest oil will answer for cutting bolts. Lathe centers cannot be saved from destruction while using a poor lubricant.

It would be proper just here to give a few items with expenses, to show the utter fallacy of this course; for figures, when put together

properly, do not lie, but space will not permit. An engine should not run over six months without applying an indicator, in order to attain the highest economy. There are not one out of a hundred engineers that can tell how many pounds of water are being evaporated per pound of coal.

The use of a poor lubricator in the cylinder is another important point. The writer was compelled for several years to use a substance that was known and sold as tallow, and was so named on the bills, but it was impossible to find sufficient evidence to prove that it ever was tallow; yet this miserable stuff was put into the cylinders, where it started a corrosive action and gradually wasted away the joints and studs, until they were thoroughly destroyed, while the cylinders were made soft, and could be cut quite easily with a knife. The whole manufacturing community ought to raise a united protest against this kind of imposition, and spare no pains to uproot the whole system. Every one who has occasion to use lubricants should inform himself of the means of detecting adulterations in them, also how to determine whether they contain anything which is destructive to metal. The writer, while conversing with the proprietor of a shop, not long since, observed that it was very difficult to see the economy in the use of poor oil. The proprietor said that if good oil were used, the men would waste it as they do the poor oil. This illustrates the carelessness on the part of the employers in not devising a system by which their men must act. I have seen a man who was employed in a shop to oil up the shafting, walk the whole length of the shop holding the snout of his oil can down, and leaving a stream of oil on the floor behind him, consequently more oil was put on the floor than was used on the shafting, for doubtless it all goes into the same account.

I was in a shop once where a barrel of oil was tapped and the men were allowed to help themselves. Some of them were so careless that they forgot to shut off the cock, therefore an immense amount of oil was allowed to run to waste. The writer, while in charge of a shop, devised an oil can to prevent this waste through carelessness. It was a plain clyinder can about 14 in. diameter and 20 in. high, with a tight vertical partition running through the middle. Two special cocks were then made of the most simple kind, the peculiar features of which were that they were opened by means of a knob attached to the stem. Upon releasing the knob a spring attached to the stem closed the valve, therefore no oil could be obtained except by pulling upon the knob. This can was placed upon a pedestal, with a drip pan attached, so that scarcely a drop of oil could be wasted. The can contained two kinds of oil, viz., Lamp and Lubricating. Although simple and inexpensive in itself it saved hundreds of dollars worth of oil. From the foregoing the reader will doubtless be enabled to form some ideas in reference to the hundreds of different ways by which lubricants are continually wasted. It is the purpose of the writer in some future issue to discuss this subject still further as to what are the duties required of a good lubricant, and the manner of detecting the adulterations commonly found in oils.

A self-operating roll train or rolling mill, continuous in its operation, has been successfully introduced in iron manufacture. The mechanism consists of a bed-plate, not bolted upon a foundation, as is customarily done with the ordinary roll trains, but resting upon stout legs that hold it ten or twelve inches above the floor. This bed-plate constitutes the seat, or resting place of ten pairs of ordinary guide-roll housings, each having two eight inch diameter chilled rolls, with but one groove in each pair, and these directly opposite or in line. By this means, when the pile or billet is entered at the first pair of rolls, it next passes to the second pair, thence to the third pair, and so on through the entire ten pairs, and is delivered a finished bar or rod of a size for a spike machine to cut into three or four sizes of spikes.—*Phila. Times.*

Engine Proportion and Construction—Main Crank Shaft and Driving Pulley.

Editor American Machinist:

In calculating the diameter of an engine crank shaft, it is necessary to consider: 1st, the strength to resist *torsional* strain, and 2d, its *stiffness*, or what is termed torsional elasticity.

It is well known that a shaft may be strong enough to stand all torsional strains that may reach it without twisting asunder, and at the same time be so *elastic* from its great length, to render it entirely unfit to drive any machinery in which steadiness of motion is at all essential. It is therefore necessary to consider the strength of shafts and their stiffness independently, following, as they do, entirely different laws. Torsional strength varies as the cube of the diameter, and is wholly independent of the length, but torsional stiffness varies directly as the fourth power of the diameter, and inversely as the length. Or $d^4 \div L$.

Now rules proper for regular line shafting, whether placed in hangers for the ordinary transmission of power, or in larger sizes running in bearings bolted to solid foundations, are *not* proper for engine crank shafts, owing, of course, to the irregularity of strains upon an engine shaft, due to the influence of crank motion and changing steam pressure.

Having the same labor to perform in foot pounds, the crank shaft must be sixty per cent. stronger than the line shaft when a single engine (one crank) is used; but with a double engine, or two cranks, one on each end of shaft at right angles, an addition to the torsional strength of twenty per cent. will answer, as far as that particular strain is concerned.

Our engine builders thirty years ago used cast-iron for crank shafts, as a forged shaft above six inches diameter at that time was worth from five to seven times as much as a cast shaft. The majority of the founders cast them solid, the result being that about one-fourth of the sectional area was *unsound*, and perfectly useless to resist any torsion. Others were wise enough to cast their shafts hollow, or with a core through them, removing fully one-fourth the sectional area, thereby adding strength to the remaining portion of shaft by the superior soundness given to it. The shafts were cast in a pit, on end, of course.

But the days of cast iron shafts are passed; we get wrought-iron of the best quality in these days at a price of about double that of cast-iron; they are much lighter, and are very stiff from being well hammered.

Of course the increased speed of engine crank shafts of the present day helps materially their transmitting power, for an 8 inch shaft transmitting one hundred horse power at sixty revolutions is one thing, and the *same shaft* carrying the *same power* at eighty-five revolutions is altogether another "individual."

But it is not a good plan to reduce too much in this direction, for the reason that the momentum of the various machinery *driven* causes a surging action which creates an excessive and irregular strain, and this must be provided for in fixing the shaft diameter.

In regard to driving pulleys, their size and manner of construction, there is much to be noticed, but I will not encroach on your valuable space to consider the subject at length.

But, Mr. Editor, I must here enter a protest, and it is against the practice of *speeding-up* old driving pulleys twenty-five, and in many cases fifty per cent. above their original speed (for the purpose of increasing power of engine).

They are absolutely dangerous, and will destroy themselves, and perhaps life and property, by bursting—from actual centrifugal force, as soon as the laws relating to the *fatigue* of metals assert themselves, as they surely will.

Persons who take so much risk seem to forget that the centrifugal force of these old pulleys increases as the square of the velocity, so that in doubling the speed they have four times the amount of centrifugal force to contend with.

In many cases of these old pulleys the sectional area of metal is able to stand the increase, but there is always a hidden enemy that no man can safely estimate the power of. I speak of the strain brought upon wheel in casting and cooling, being in halves generally, and consequently large castings. We all have seen apparently sound and beautiful pulleys, from ten to sixty inches diameter, burst asunder in the lathe, the very moment an ordinary cut was started, or by the simple matter of a fall of one or two inches. Even these pulleys, small as they are, are very dangerous when running (if they escape detection in the shop); but to what magnitude is this danger increased, when the diameters and weights are as great as they are in engine-driving pulleys.

As I believe the best results from driving belts are obtained at a speed per minute of from 3,000 to 3,800 feet, I do not think it necessary to make any driving pulley for mills or general manufacturing over 14 feet diameter, and in most instances not over 12 feet, (Piston speed from 600 to 900 feet).

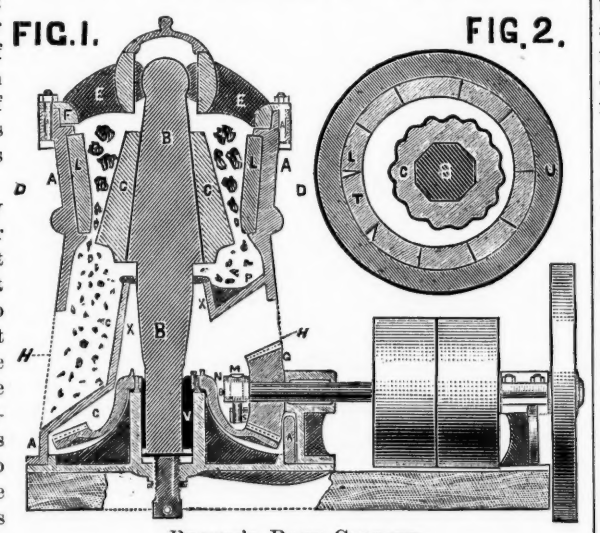
I believe also that all driving pulleys over 8 feet diameter, where *high speed* is used, should be made in *six* segments instead of *two*, and if they are well put together, can be run at any practical speed without the slightest danger of rupture.

The extra cost is more than compensated by absolute safety.

No driving pulley should have a velocity of more than 75 feet per second, the point of rupture being with the ordinary casting a little more than 300 feet per second; this allows for a factor of safety 4, as far as vibrations and shocks from rapid speed is concerned, and according to rules above quoted, as relates to tensile strength or rupture, a factor guiding the construction of fly wheels and large pulleys little enough all must admit, but there are old pulleys running to-day at the rate of 60 feet per second, and are consequently dangerous in the extreme.

WM. H. HOFFMAN,
August 31st, 1879. Passaic, N. J.

FIG. 1. FIG. 2.



BROWN'S ROCK CRUSHER.

The Compression of Steam.

Mr. Editor:

I have been deeply interested in the discussion of the relative merits and demerits of steam compression, as a matter of economy.

Thinking that perhaps a few lines on the subject might not be amiss, I will venture to give my ideas regarding it.

First: I think that re-compression would be a more appropriate and definite term to apply to this theory of secondary compression of partially expanded steam, being more comprehensive, as the original compression is performed by chemical means, while this re-compression is effected by mechanical means.

It is an axiom in mechanics, that machinery in motion produces friction, and, that the greater the load, the greater the friction, also that it requires power to overcome it.

It is generally conceded, that beneficial results are obtained by cushioning the piston sufficiently to relieve the reciprocating ports by arresting the motion, etc. But this theory of re-compressing partially expanded steam so as to obtain any practical results above the power absorbed, either as a spring giving back equally as it absorbs, or in any way tending to relieve the friction, except when used homeopathically, as a cushion to arrest the motion at the dead points, or, that it elevates the temperature of the cylinder to any appreciable extent, I doubt, and will proceed to prove my doubts.

We will take into consideration, if you please, the ordinary type of variable automatic cut-off engines, running under a constant load.

The supply of steam being cut off early in the stroke, the impelling power is then due to the expansive force inherent in itself. The consequent result of such expansion is a gradual diminution of force.

While we have this constantly decreasing force upon one side of the piston, we have upon the other, by the early closure of the exhaust valve, the re-compression of the remaining partially expanded steam, gradually increasing its density, and consequently its power for resistance until the resistance is equal to or greater than the impelling power, and the stroke not yet quite completed.

What, then, is to carry the piston on to the completion of its stroke?

As there is no other impelling power but the steam, which is inoperative, or nearly so, against the increased resistance, it obviously must fall back on the fly-wheel as a reservoir of motion, to supply the deficiency from its momentum.

The consequent result is, an increase of load, ergo, an increase of friction, requiring power to overcome a loss of momentum from the fly-wheel having to do actual work; therefore, a direct loss of power, which must be restored by a latter cut-off and more steam in the subsequent stroke.

The piston, after having passed the dead point, being relieved from the increase of load, and being under the influence of the increased quantity of steam, will have a more rapid motion through the center travel of the cylinder, decreasing again as the resistance of re-compression begins to exert its influence, thus making the engine unsteady in its working and variable in its power.

So far as a loss of heat is concerned, I do not think that a properly jacketed cylinder is so susceptible of "lightning changes" as to show any material diminution of temperature in so short a period. D. F. NISBET.

SYRACUSE, Aug. 25, 1879.

Brown's Patent Rock and Ore Breaker.

The stone and ore breaker, shown in Figs. 1 and 2, has a cylinder for the breaking device, and a continuous or rotary motion instead of a vibratory, giving it advantages similar to those of a rotary (circular) saw over the up-and-down saw.

It is claimed to be subject to not more than one-fifth the strain that is liable to come on other crushers, because the whole surface of other crusher faces is liable to come in contact with ore at any time, while not a tenth of this crusher face can strike ore at any one time. Fig. 1 is a vertical section through the center. Fig. 2 is a horizontal section on the line DD. In Fig. 1, AA represents an upright circular shell. This shell has an opening, H, on one side, for the egress of the crushed ore. BB is an upright shaft, the upper end of which is pivoted with a ball or socket bearing. The lower end of the shaft is pivoted in the hub of the bevel gear, G. This bearing is placed in an eccentric position, with reference to center of the hub. The breaking head receives an eccentric gyratory motion from the eccentrically-placed bearing in the hub of the gear below, and advances successively towards every portion of the outer wall, crushing the ore between the two surfaces, LL and CC, which are chilled faces. V is a composition box or bearing. T is one of the concave plates to be taken out first when putting in new chills, is narrowest on back, and can be driven out by a punch, a hole being left in shell for the purpose. E is opening where the rock or ore is fed into the crusher. Manufactured by the Gates & Scoville Iron Works, Chicago, Ill.

Steam Engineering.

Part III.

BY CHAS. A. HAGUE.

The necessity that dictates the use of superheated steam is an indication of loss of heat.

Probably the most universal of natural laws is that which controls the tendency of forces in their efforts towards equilibrium. When we wish to produce a certain effect we practically destroy the equilibrium of certain forces by suitable means; and during the efforts of nature to restore the balance, advantage is taken of the operation in a manner calculated to accomplish the ends in view; but, after the action is complete, it will be found that the gross value of the elements with which we started, and the equivalents obtained are not quite equal, a certain value of the elements having been absorbed or rendered latent; a familiar instance of this class of useful effect is the friction which accompanies all mechanical efforts; the property of matter termed "inertia," also operates to prevent the realization of the full equivalent. A body at rest, but free to move, absorbs a certain percentage of the value of the effort which endeavors to set it in motion, before the body is actually moved; the effort thus absorbed is rendered latent, or expended without producing sensible effect, and the property (of the body) which balances this latent effect is its inertia; on the other hand, a body in motion resists the effort to bring it to rest by this same property of inertia; and if all the influences on one side and the effects on the other could be accurately dertermined in any physical operation they would be found to be exactly equal.

Heat is most particularly sensitive to this "balance-of-power" phenomonon; heat always endeavors to bring everything to a uniform temperature, hence, the transmission must be from the hottest to the coolest body; and just as soon as some genius discovers a process by which heat can be induced to reverse this operation, he may safely conclude that the elements of "perpetual motion" have been at last found.

A logical deduction from the theory of "mechanical equivalent of heat," would seem to be, that *dry saturated steam in the cylinder at the instant of cut-off* is one of the conditions necessary to the utmost economy in the conversion of heat into work by expansion; because dry saturated steam exerts the most force in proportion to its contained heat. If steam is over saturated the latent heat contained in the overplus of water is unavailable for producing dynamic effect, and is therefore wasted unless sufficient additional heat can be furnished to complete the evaporation; but ordinarily the heat of cylinder and pipes is of somewhat lower degree than that of the steam, and as the efforts to produce equilibrium impels heat towards the coolest matter, no additional heat can be made available, and the result is that a considerable percentage of "heat value" is carried in a latent state to the condenser, or into the atmosphere, as the case may be.

To provide against this loss of latent heat and ensure the delivery of dry steam into cylinder, it becomes necessary to furnish the steam with a sufficient overplus of "sensible heat" to enable it to well afford all unavoidable losses during its passage from the heating surfaces in boiler to its contact with the piston in cylinder; the number of units of heat thus lost, by a slight waste of sensible temperature, is very small compared with that which would pass away in a latent state if the steam were over-saturated. This brings us back to the statement with which we started in regard to loss indicated by the practice of superheating steam; but, as superheating entails the least reduction of net heat value of the fuel, it is probably the best practice, all things considered; one fact, however, must be borne in mind, and that is, in common with all benefits, superheating may be carried to a fanatical extreme and bring about losses of another nature which would exceed those resulting from over-saturation.

Again, reasoning from our "mechanical-equivalent" theory, the conclusion seems unavoidable, that if heat is converted into work during expansion, the steam must part with the number of units of heat thus converted, for we cannot hope to obtain the "equivalent" of heat in dynamic energy and possess the heat also; also if the steam was dry saturated at the point of cut-off it must become over-saturated as soon as expansion and conversion begins, because the water that, in the boiler, had absorbed the heat just converted and parted with, is placed in the interesting situation of a celebrated dramatic character, and its "occupation is gone."

Now, supposing the cylinder and piston, at the instant of cut-off, to be at the same temperature as the initial steam, then just as soon as the presence of unevaporated water is manifested, or in other words, as soon as steam begins to condense by parting with this heat, which is converted into work, the released water instantly absorbs a portion of the heat of cylinder and is re-evaporated. This operation continues to the end of the stroke and results in a slight reduction in the heat of the iron; the pressure resulting from this evaporation adds of course, to the mean pressure on piston, and would be a decided gain if the initial steam at the next admission did not instantly endeavor to restore the equilibrium of temperature between itself and the iron, suffering condensation, of course, to the extent of heat absorbed from cylinder during the preceding stroke.

FIG. 1.

FIG. 2.

At the instant of the second cut-off the steam would thus be over-saturated; if sufficient heat were absorbed from the incoming steam, by the cylinder and piston, to bring them again to the initial temperature, this moisture could not evaporate while the initial pressure continued; because the temperature of the iron and steam would just correspond to the pressure, the mass of steam could not reduce itself to a lower pressure and temperature, and by absorbing heat from cylinder become "dry saturated," until movement of the piston enlarged the volume, it being remembered that for a dry saturated condition to obtain volume, density and temperature must bear certain arbitrary relations to each other.

The evaporation of the surplus moisture carried by initial steam, and also of water set free by second expansion, would operate to still further reduce temperature of the iron than at end of the preceding stroke; the next (third) inflow of initial steam would suffer still further condensation than its predecessor, and at instant of (third) cut-off a still greater change of moisture would be present in the steam than before evaporation would again follow during (third) expansion; these alternate operations would continue until so much moisture was present in the cylinder that the time occupied by the expansion was insufficient to evaporate it all, and the rate of condensation of initial steam would be reached, the temperature of the iron would maintain an average somewhere between those due to the highest and lowest pressures of steam; the mean pressure would be, of course, slightly increased by the re-evaporation during expansion, but the loss of heat rendered latent (heat held by moisture not thoroughly evaporated) would more than equal the advantage.

If the above deduction is the legitimate result of expansion, when no additional heat is furnished to the cylinder during expansion, then the problem obviously is, to devise means by which heat may be conducted to cylinder to make good the loss which results from this re-evaporation of water set free when heat is taken from the steam and converted into work.

The principal loss does not result merely from the heat required to re-evaporate the released water, but from the aggregate of losses that seem to follow each other in almost geometrical progression. If the cylinder can be defended against loss of heat resulting from the demands of the *first re evaporation*, the after evils of condensation, etc., could not occur; the main obstacle in the way of furnishing the cylinder metal with this necessary heat is, that the supply cannot be controlled, for heat continues to be absorbed by the steam even after all moisture is evaporated, during exhaust; also, while escaping steam continues in contact with cylinder metal, the absorption of heat continues. But there is one consolation, and that is, that dry steam does not begin to absorb the heat as rapidly as the over-saturated article, for the law of equilibrium, coming into play, retards the transmission more and more as the two bodies approach a balance of temperature, and as the latent heat in steam is by far the greatest value, it follows that when the point is reached, that all moisture is thoroughly evaporated, the difference in "sensible temperature" is not very great even between initial and counter pressures.

CHICAGO, Aug. 22, 1879.

Improved Double Stem Gate Valve.

The gate valve shown in the two illustrations on this page has been produced in response to a demand for a stop valve which will permit of the removal of its parts for repair, or other purpose, without necessitating a complete exhaustion of the pressure in the chambers which it is intended to separate, or unite, as the case may be. This valve is adapted to the purposes of gas users, manufacturers of artificial ice, and others.

From Fig. 2 it will be clearly understood how one pair of gates may be removed from the machine, without necessitating any relaxation of pressure, or any loss of gas whatever.

The great advantages claimed for this valve are as follows:

1. The two sets of gate combinations are so arranged, in a double-ended-valve body, as to permit of using either one of them over the same valve seats at pleasure.

2. That if one pair of said gates have, by use, become worn, then the other pair may be used at once, and all over the same valve seats.

3. That if one pair of gates have become worn, and require renewal or repair, then the said worn pair may be taken from the machine without exhausting the pressure in the chambers of the engine.

4. That the valve seats are made of a hard metal, while the faces of the gates are of a softer material, thereby removing all wear to the softer faces.

5. That the gates do not rub and slide over the seats, but that they are brought opposite to them before being jammed upon them.

6. That all valves are tested to 200 lbs. hydraulic pressure—or more, if required—before leaving the factory.

These valves are furnished with either flanges or screw sockets, or screw lock nuts, so that no changes in pipes need be made, if parties wish to exchange their leaky valves for some of these. They are made by Edward C. Post, 90 St. Clair St., Toledo, O.

Paper is now substituted for wood in Germany in the manufacture of lead pencils. It is steeped in an adhesive liquid, and rolled round the core of lead to the required thickness. After drying, it is colored, and resembles an ordinary cedar pencil. The pencils sell in London to retailers at about 65 cents a gross.

The citizens of Pittsburgh, Wheeling, and Cincinnati are greatly exercised by the smoke nuisance in those cities. Except when intense heats are demanded, as for iron making or working, for all manufacturing purposes, and under boilers, the smoke from Western coal is at once preventible, and is only allowed because the community enjoys it and the consumer of coal does not care to prevent it.

Patented and unpatented ways are open, and much saving will result from their adoption. Even the objection to prevention of smoke in furnaces for intense heat has been removed by the Siemens furnace, which, with the poorest slack fuel, produces the highest, cleanest heats obtainable, without a particle of smoke. Any Western city has only to enact "there shall be no smoke" and there will be none, and the smoke producers will be enriched by the enforcement of the law.—*Plumber and Sanitary Engineer.*

Properties of Iron and Steel.

The report of the United States Board appointed to test iron, steel and other metals, is an interesting and valuable work of which but a few copies were printed. It is hoped that Congress at its next session will make a liberal appropriation to print a large edition of this work as its extended use, for reference will greatly aid all workers in iron, steel and metals; We make the following extract from the volume referred to.

WELDING.

Before comparing the irons under this head, it may be well to briefly consider the heretofore ascertained facts, and the speculations which grow out of them. The generally received theory of welding is that it is merely pressing the molecules of metal into contact, or rather into such proximity as they have in the other parts of the bar. Up to this point there can hardly be any difference of opinion, but here uncertainty begins.

What impairs or prevents welding? Is it merely the interposition of foreign substances between the molecules of iron and any other substance which will enter into molecular relations or vibrations with iron? Is it merely the mechanical preventing of contact between molecules, by the interposition of such substances? This theory is based on such facts as the following: 1. Not only iron, but steel, has been so perfectly united that the seam could not be discovered, and that the strength was as great as it was at any point, by accurately plaining and thoroughly smoothing and cleaning the surfaces, binding the two pieces together, subjecting them to a welding heat, and pressing them together by a very few hammer-blows. But when a thin film of oxide of iron was placed between similar smooth surfaces, a weld could not be effected.

2. Heterogeneous steel-scrap, having a much larger variation in composition than these irons have, when placed in a box composed of wrought-iron side and end pieces laid together, is (on a commercial scale) heated to the high temperature which the wrought iron will stand, and then rolled into bars which are more homogeneous than or-

dinary wrought iron. The wrought iron box so settles together as the heat increases that it nearly excludes the oxidizing atmosphere of the furnace, and no film of oxide of iron is interposed between the surfaces. At the same time the inclosed and more fusible steel is partially melted, so that the impurities are partly forced out and partly diffused throughout the mass by the rolling.

The other theory is that the molecular motions of the iron are changed by the presence of certain impurities, such as copper and carbon, in such a manner that welding cannot occur or is greatly impaired. In favor of this theory it may be claimed that, say, 2 per cent. of copper will almost prevent a weld, while, if the interposition theory were true, this copper could only weaken the weld 2 per cent., as it could only cover 2 per cent. of the surfaces of the molecules to be united. It is also stated that 1 per cent. of carbon greatly impairs welding power, while the mere interposition of carbon should only reduce it 1 per cent.

On the other hand, it may be claimed that in the perfect welding due to the fusion of cast iron, the interposition of 10 or even 20 per cent. of impurities, such as carbon, silicon, and copper, does not affect the strength of the mass as much as 1 or 2 per cent. of carbon or copper affects the strength of a weld made at a plastic instead of a fluid heat. It is also true that high tool-steel, containing 1½ per cent. of carbon, is much stronger throughout its mass, all of which has been welded by fusion, than it would be if it had less carbon. Hence copper and carbon cannot impair the welding power of iron in any greater degree than by their interposition, provided the welding has the benefit of that *perfect mobility* which is due to fusion. The similar effect of partial fusion of steel in a wrought iron box has already been mentioned. The inference is that imperfect welding is not the result of a change in molecular motions, due to impurities, but of imperfect mobility of the mass—of not giving the molecules a chance to get together.

Should it be suggested that the temperature of fusion, as compared with that of plasticity, may so change chemical affinities as to account for the different degrees of welding power, it may be answered that the temperature of fusion in one kind of iron is lower than that of plasticity in another, and that as the welding and melting points of iron are largely due to the carbon they contain, such an impurity as copper, for instance, ought, on this theory, to impair welding in some cases and not to affect it in others. This will be further referred to.

The next inference would be that by increasing temperature we chiefly improve the quality of welding. If temperature is increased to fusion, welding is practically perfect; if to plasticity and mobility of surfaces, welding should be nearly perfect.

Then how does it sometimes occur that the more irons are heated the worse they weld?

1. Not by reason of mere temperature; for a heat almost to dissociation will fuse wrought iron into a homogeneous mass.

2. Probably by reason of oxidation, which, in a smith's fire especially, necessarily increases as the temperature increases. Even in a gas furnace, a very hot flame is usually an oxidizing flame. The oxide of iron forms a dividing film between the surfaces to be joined; while the slight interposition of the same oxide, when diffused throughout the mass by fusion or partial fusion, hardly affects welding. It is true that the contained slag, or the artificial flux, becomes more fluid as the temperature rises, and thus tend to wash away the oxide from the surfaces; but inasmuch as any iron, with any welding flux, can be oxidized till it scintillates, the value of a high heat in liquefying the slag is more than balanced by its damage in burning the iron.

3. But it still remains to be explained why some irons weld at a higher temperature than others; notably, why irons high in carbon or in some other impurities can only be welded soundly by ordinary processes at low heats. It can only be said that these impurities, as far as we are aware, increase the fusibility of iron, and that in an oxidizing flame oxidation becomes more excessive as the point of fusion approaches. Welding demands a certain condition of plasticity of surface; if this condition is not reached, welding fails for want of contact due to mobility; if it is exceeded, welding fails for want of contact due to excessive oxidation. The temperature of this certain condition of plasticity varies with all the different compositions of irons. Hence, while it may be true that heterogeneous irons, which have different welding points, cannot be soundly welded to one another in an oxidizing flame, it is not yet proved, nor is it probable, that homogeneous irons cannot be welded together, whatever their composition, even in an oxidizing flame. A collateral proof of this is that one smith can weld irons and steels which another smith cannot weld at all, by means of a skillful selection of fluxes and a nice variation of temperature.

To recapitulate: It is certain that perfect welds are made by means of perfect contact due to fusion, and that nearly perfect welds are made by means of such contact as may be got by partial fusion in a non-oxidizing atmosphere, or by the mechanical fitting of surfaces, whatever the composition of the iron may be within all known limits. While high temperature is thus the first cause of that mobility which promotes welding, it is also the cause, in an oxidizing atmosphere, of that "burning" which injures both the weld and the iron. Hence, welding in an oxidizing atmosphere must be done at a heat which gives a compromise between imperfect contact due to want of mobility on the one hand and imperfect contact due to oxidation on the other hand. This heat varies with each different composition of irons. It varies because these compositions change the fusing points of irons, and hence their points of excessive oxidation. Hence, while ingredients, such as carbon, phosphorus, copper, &c., positively do not prevent welding under fusion, or in a non-oxidizing atmosphere, it is probable that they impair it in an oxidizing atmosphere, not directly, but only by changing the susceptibility of the iron to oxidation.

The obvious conclusions are: 1st. That any wrought iron, of whatever ordinary composition, may be welded to itself in an oxidizing atmosphere at a certain temperature, which may differ very largely from that one which is vaguely known as a "welding heat." 2d. That in a non-oxidizing atmosphere, heterogeneous irons, however impure, may be soundly welded at indefinitely high temperatures.

Over fifty patents have been obtained for cow milkers, thirteen in England and forty in America. These machines have been divided into three classes. First, tube-milkers; second, sucking machines; third, mechanical handmilkers. The first are tappers, the second suckers, and the third squeezers and strippers. Some devices are formed of combinations of these classes. As yet no one machine can be considered a success.

The people of Fall River are unhappy; almost a week has passed without a defalcation.

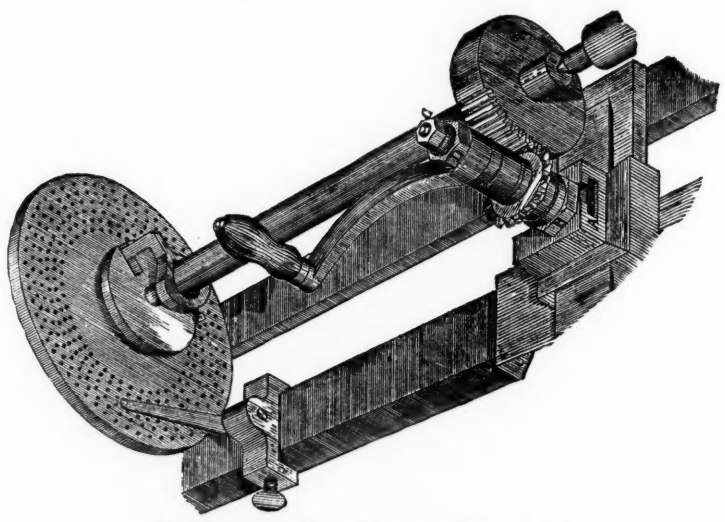
Main's Fluting and Gear-Cutting Lathe Attachment.

The machinist, amateur, or model maker, who is not so fortunate as to possess a milling machine, is often obliged to spend hours in the tedious operation of filing grooves in taps or reamers of his own manufacture. The file is apt to slip and the result is at best but an unsightly and "home-made" looking tool.

The action of a rotary cutter is more perfect and economical than that of a planing tool, for, with the planer much time is lost in numerous return strokes, and power consumed in sliding a heavy bed plate back and forth. Although drills, planers and shapers actuated by a hard crank prove effective tools, no milling tool operated in this way has been manufactured, and the mechanic is often compelled to grind away metal in powder, with a file, that a milling cutter would remove more neatly and quickly in chips. The attachment, herewith illustrated, is claimed to be the simplest and most effective of its kind that has been offered to the public.

As used for fluting taps, etc., it is composed, beside the nuts and washers, of but three pieces. A steel sleeve carrying the cutter, washers and handle, slips over an upright pin or arbor extending through it, and fixed in the place usually occupied by the tool post.

This central statuary pin is welded to the broad flat nut "B," and ends below in a screw passing through an oblong nut, which slips into the "T" shaped slot of the slide rest.



FLUTING AND GEAR-CUTTING ATTACHMENT.

The end of this nut is seen at "A." A wrench applied to "B" draws up "A," and secures the pin firmly in place. The sleeve terminates below in a collar seen just above "B," against which the cutter, washers and handle are secured by the nut "D." A feather on the sleeve keeps the handle and cutter from slipping around.

The nut "C" is screwed on the top end of the central pin or arbor; underneath it is a small washer, kept from turning by a stud. This upper nut and washer serve to keep the sleeve down in place without binding. They of course remain stationary.

The mode of securing the index-plate to the face-plate, and the spring-stop to the ways, is too obvious to require explanation.

A set of nine washers accompanies each tool. They run in thickness by hundredths of an inch, viz., .50, .50, .20, .20, .10, .05, .02, .02, .01. The cutter can be adjusted in height to the one-hundredth of an inch, by putting the proper number of washers underneath it.

If a level wheel is to be cut, the slide rest has to be set at an angle to turn up the blank; after turning the tool post is replaced by the cutting attachment, and the work of cutting teeth commenced. The index-plate and the gear may both be as large as the lathe will swing, and the work is finished before removing it from the lathe.

The narrow deep groove required for setting a feather can hardly be made with a file, but is quickly cut with this attachment, while the length of the work may be as great as the lathe will accommodate. Using a broad-faced cutter, nuts can be milled up in one-tenth of the time required to finish with a file.

A tram-wheel is cut by mounting horizontally on the sleeve, and allowing it to turn as the edge is acted on by a hub revolving in the lathe.

No index-plate is needed for fluting taps or reamers, as the lathe can be locked at various points by turning on the back gear. Cutters with 7-8 in. hole are used.

This attachment was patented July 15, 1879, and is manufactured and for sale by the inventor, W. Main, Piermont, N.Y.

A man in Bridgeport, Conn., has invented a very simple but ingenious machine for ironing shirts. It consists of an iron framework about five feet long, three feet wide and two and a half high. On the top of this framework is attached the iron, which is a hollow cylinder or roller, sixteen inches long and eight inches in diameter. This is provided with arms at each end, and, being attached to a crank, when in motion it rides back and forth on the framework. The cylinder is heated by gas. An attachment called the bosom board is connected at the end of the frame by hinges. The operator stands at the end of the frame and operates the machine very simply. The shirt is placed over the board the same as when ironed by hand, being drawn tight and smooth. The board is then thrown down in its place with the bosom upward. The heated cylinder passes over and finishes the work. This machine is capable of ironing from five hundred to six hundred shirts a day.—*N. Y. Evening Post.*

Useful Information for Engineers.

BY STEPHEN ROPER.

Rule for finding the horse power of steam engines.—Multiply the area of the piston, by the average pressure* in lbs. per square inch; multiply this product by the travel of the piston in feet per minute; divide this product by 33,000, the quotient will be the horse power.

EXAMPLE:

Dia. of Cyl. ..... 10 in.
Area ..... 78.54 ins.
Average pressure ..... 40 lbs. per sq. in.
Travel of piston in ft. per minute .. 300 ft.

78.54
40
3141.60
300
33000) 942480.00
28.56 horse power.

Rule for finding the horse power of steam engines by indicator diagrams.—Multiply the area of the piston by its travel in feet per minute, and divide by 33000; the quotient will give the value of one pound mean effective pressure, which, if multiplied by the total mean effective pressure, as shown by the card, will give the indicated horse power.

EXAMPLE:

Area of piston 113
Travel of piston in feet per minute .. 333⅓

$\frac{113 \times 333\frac{1}{3}}{33000} = 1.141$ H. P. value of 1lb. M. E. P.
36 M. E. P. as shown by card.

6846
3423
41.076 horse power.

Rule for finding the horse power of locomotives.—Multiply the area of the piston by the pressure in lbs. per square inch, which should be taken at about ⅞ the boiler pressure; multiply this product by the number of revolutions per minute; multiply this by twice the length of the stroke; multiply this product by 2, and divide by 33,000, the result will be the horse power.

EXAMPLE:

Dia. of Cyl. ..... 19 in.
Area ..... 283.5 sq. in.
Stroke ..... 24 in.
Dia. of drivers ..... 54 in.
Running speed ..... 20 miles per hour.
Boiler pressure ..... 130 lbs. per sq. in.
Maximum pressure in cylinders 80 lbs. per sq. in.

$\frac{283.5 \times 80 \times 4 \times 124 \times 2}{33000} = 681.6$ horse power.

* See Roper's Hand Book of Land and Marine Engines, pages 49 and 50.

Rule for finding the horse power of steam fire engines.—Multiply the area of the piston* by the steam pressure in lbs. per sq. inch; Multiply this product by the travel of the piston in feet per minute, divide by 33,000, and .7 of the quotient will be the horse power.

EXAMPLE:

Area of piston.....50.2656 sq. in.
Steam pressure.....60 lbs.
Travel of piston.....250 feet.

50.2656
60
3015.9360
250
1507968000
60318720
33000) 753984.0000
22.81
.7
15.967 horse power.

Rule for finding the required diameter of a cylinder for an engine of any given horse power, the travel of piston, and available pressure being given.—Multiply 33,000 by the number of horse power; multiply the travel of piston in feet per minute by the available pressure in the cylinder. Divide the first product by the second; divide this quotient by the decimal .7854. The square root of the quotient will be the required diameter of the cylinder.

Rule for finding the quantity of steam any engine will use at each stroke of the piston.—Multiply 6 times the area of the cylinder by $\frac{1}{8}$th, the stroke, and divide by 1728; the quotient is the cubic contents of the cylinder in feet; divide this quotient by the cut-off $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{1}{8}$, as the case may be, the result will be the quantity of steam used at each stroke of the piston.

Rule for finding the cubic contents of a steam cylinder.—Multiply the area of the cylinder in inches, by the length of the stroke in inches, and divide this product by 1728. The quotient will be the number of cubic feet.

Rule for finding the horse power of wind storms.—Multiply the area acted on in inches, by the pressure in pounds per square inch; then multiply this product by the speed in feet per minute, and divide by 33,000. The quotient will be the horse power of the storm.

EXAMPLE: 2,007,244,800 square inches × 1.5 pounds pressure × 5,800 feet ÷ 33,000 give as a result, 70,557,700 horse power developed for each mile of breadth of the track of the storm.

Rule for finding the horse power of water falls.—Multiply the area of the cross section of the water fall in feet, by its velocity in feet per minute; this product will give the number of cubic feet flowing through per minute. Multiply this by 62½ pounds, the number of pounds in a cubic foot of water; multiply this last product by the fall in feet, and divide by 33,000. The quotient will be the horse power of the water fall.

EXAMPLE:—With a stream or flume 10 feet; depth 4 feet; area of cross section 40 feet; velocity in feet per minute 150. Then, 40 × 150 =6000 cubic feet of water per minute; 6000 × 62½=375000 pounds of water per minute. 10 × 375,000 = 3,750,000 foot pounds of the water fall; 3,750,000 ÷ 33,000 = $113\frac{7}{11}$ horse power of water fall.

Rule for finding the contents of an elliptic or oval tank in cubic feet or gallons.—Multiply the long diameter in inches by the short diameter in inches, this product by .7854, and this last product by the height of the tank in inches, then divide by 1728, and the result will be the contents of the tank in cubic feet, which if multiplied by 7.5 gives the number of U. S. gallons in the tank.

Rule for finding the quantity of water which any square or rectangular box or tank is capable of containing in cubic feet or U. S gallons.—Multiply the length of the sides in inches by their height in inches, then multiply the width of the ends in inches by their height in inches. Add these two products together and divide by 1728. The product will be the contents in cubic feet. This result being multiplied by 7.5 gives the result in U. S. gallons.

Rule for finding the cubical contents of a triangular tank.—Multiply the length of the base by half its height; multiply this by .7854, then divide the product by 1728; the quotient will be the number of cubic feet, which, if multiplied by 7.5, will give the number of U. S. gallons in the tank.

* If double engines, multiply by 2.

The New Canadian Tariff.

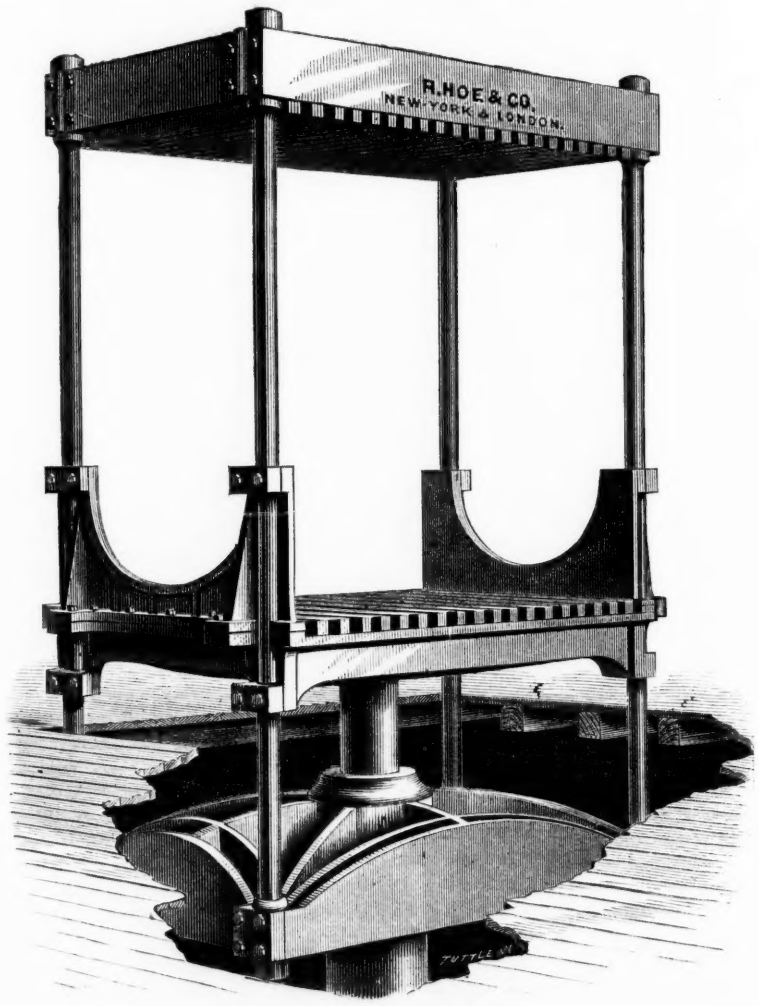
We append below extracts from the new Canadian Tariff, showing the status of the machinery and kindred interests under it. Also below will be found the list of exemptions under these heads.

RATES OF DUTY.

Babbit metal, *ad val*.	10	per ct.
Book-binders' tools and implements, including ruling machines and binders' cloth, *ad val*.	15	per ct.

IRON AND MANUFACTURES OF, VIZ.:

Pig, per ton	$2	
Old and scrap, per ton	$2	
In slabs, blooms, loops or billets, puddled or not, and muck and puddled bars or billets, *ad val*.	12½	per ct.



NEW COTTON BALING PRESS.

In bars, rolled or hammered, including flats, rounds and squares, nail and spike rods, and all other iron not otherwise provided for, *ad val*.	17½	per ct.
Rolled, round wire rods, in coils under half an inch in diameter, *ad val*.	10	per ct.
Iron rails or railway bars for railways or tramways, *ad val*.	15	per ct.
Railway fish plates, frogs, frog-points, chairs and finger-bars, *ad val*	17½	per ct.
Tin plates, *ad val*.	10	per ct.
Band and hoop, sheet, smoothed or polished, coated or galvanized and common or black, and boiler plate, No. 17 gauge or thinner, and Canada plates, *ad val*.	12½	per ct.
Iron and steel wire, galvanized or not, *ad val*.	15	per ct.
Stoves and other castings, not elsewhere specified, *ad val*.	25	per ct.
Gas, water and soil pipes of cast iron, *ad val*.	25	per ct.
Car-wheels and axles, *ad val*.	25	per ct.
Rolled beams, channels and angle and T iron, *ad val*.	15	per ct.
Iron bridge and structural iron work, malleable iron castings and iron safes, and doors for safes and vaults, *ad val*.	25	per ct.
Mill-irons and mill cranks, and wrought forgings, for mills and locomotives, or parts thereof weighing 25 lbs. or more, *ad val*.	20	per ct.
Locomotive engines and stationary, fire or other steam engines and boilers, and other machinery composed wholly or in part of iron, *ad val*.	25	per ct.
Locomotive tires of steel or Bessemer steel in the rough, *ad val*.	10	per ct.
Drawn boiler tubing, *ad val*.	10	per ct.
Bedsteads and other iron furniture and ornamental iron work and wire work, *ad val*.	25	per ct.
Skates and locks of all kinds, *ad val*	30	per ct.
Tinned, glazed or enameled hollow-ware, of cast or wrought iron, *ad val*.	25	per ct.
Leather belting	25	per ct.
Printing presses of all kinds, *ad val*.	15	per ct.
Steel, and manufactures of, viz.: On and after the first day of January, 1881, steel in ingots, bars, sheets and coils and railway bars or rails and fish plates, *ad val*.	10	per ct.
Shovels, spades, hoes; hay, manure, and potato forks; rakes and rake teeth; carpenters', coopers', cabinetmakers', and all other mechanics' tools, including files, edge tools of every description, axes, scythes, and saws of all kinds, *ad val*.	30	per ct.
Firearms, viz.: Muskets, rifles, pistols and shot guns; cutlery, and all manufactures of steel, and of iron and steel, not elsewhere specified, *ad val*.	20	per ct.
Knife blades or knife blanks, in the rough, unhandled, for use by electro-platers, *ad val*.	10	per ct.
Stereotypes and electrotypes of standard books, *ad val*.	10	per ct.
Stereotypes and electrotypes for commercial blanks and advertisements, *ad val*	20	per ct.

EXEMPTIONS.

Locomotives and railway passenger, baggage and freight cars, being the property of railway companies in the United States, running upon any line of road crossing the frontier, so long as Canadian locomotives and cars are admitted free under similar circumstances in the United States, under regulations to be prescribed by the Minister of Customs,—machinery for worsted or cotton mills of kinds which are not manufactured in Canada,—wearing apparel, household furniture, professional books, implements and tools of trade, occupation or employment, which the settler has had in actual use for at least six months before removal to Canada, not to include machinery, or live stock, or other articles imported for use in any manufacturing establishment, or for sale, provided that any dutiable article entered as settlers' effects shall not be sold or otherwise disposed of without payment of duty until after two years' actual use in Canada. Until the first day of January, 1881, steel in ingots, bars, sheets and coils, railway bars or rails and fish-plates, shall be free of duty.

Hook Motion Compared with Modern Link Motion.

Editor American Machinist:

Old time R. R. master mechanics and engineers frequently assert that the hook engines, with independent cut-off, were smarter, more economical, and would do as much work with 100 pounds of steam as the present link engine will with 130 pounds. The more modern brother can't see it; attributes such assertions to a want on the part of the old-timers of "getting ahead" of them. "Why," the young ones say, "what can you want more handy than the link? It is simpler, stays out of the shop longer, and cuts off in either direction." Nevertheless the old-timers know whereof they speak, and their assertions of superiority on the part of the hook are well founded.

The hook engine carries its steam to the same point of the stroke before exhausting, regardless of the point of cut-off. The link, on the contrary, exhausts earlier, as the cut-off is earlier, and in the earlier cut-off points with the link, the compression and back pressure are necessarily excessive. The old-time hook engine of 24 in. stroke exhausted at 22 inches. The link, as will be seen by the following table, exhausts much earlier in the same stroke engine.

TABLE.

Valve $\frac{5}{8}$th lap—Travel 5 in.—Link,

CUT-OFF.	COMMENCEMENT OF EXHAUST.	With the hook these points of exhaust would all have been 22 in.
4 in.	12¾ in.	
6 "	15 "	
8 "	16½ "	
10¼ "	18 "	
$12\frac{1}{16}$ "	$18\frac{9}{16}$ "	
15 "	20⅛ "	
18 "	21¾ "	

Thus, at a cut-off of 4 inches, the exhaust opens at 12¾ inches, leaving 11¼ inches or 47 per cent. of the stroke nearly to be traveled, with no impelling pressure behind it. With the hook the steam would have been expanded to 22 inches. As the cut-off increases the percentage of piston travel, unaided by steam pressure, is decreased with the link. As before stated, the hook has no such loss, the steam following at all cuts to $\frac{9}{16}$ of the stroke, thus expanding the steam to a much lower terminal pressure, economy and effectiveness necessarily resulting. Increasing the lap of the link engine would result in economy in the finer cuts, decreasing as the length of cut-off is extended. In practice, however, the long lap, although more economical in the finer cuts, as compared with shorter lap, leaves the engine "logy" and a long time in "picking up" a train. Thus the link at best has serious drawbacks, while the hook is notoriously quick on the start, and, as shown by the table, and by actual experience as well, is far more economical in the use of steam. It is urged against the hook engine that it is more expensive to keep up. This assertion is made only by the more modern members; for who is there who has had experience with the old time hook engine as well as the link, who has not from his experience found the hook engine to be of less bother and less ex-

pensive than the link? The link engine has four eccentrics, the hook six, but in either the eccentrics are the last things to require attention. The hook has, it is true, two more rocker shafts, stem and valves than the link, but there is actually, in the writer's experience, less trouble to keep them up than the link, with its eternally cut force and loose block, very expensive to repair. Even if the hook were the more bothersome it would be of no consequence, in view of the immensee conomy effected by its use. The objection that the hook will cut off only while going ahead is without ground; several arrangements of independent cut-offs will act equally well in either motion. It is customary to call those who advocate the hook "old fogies, etc.," but they can stand it when the hook is some 25 per cent. superior to the link.

V. HOOK.

New Embossing Press and New Hydraulic Baling Press.

The cut on this page represents R. Hoe & Co.'s new style Embossing Press, which has been entirely remodeled and its general efficiency greatly increased.

This press is massive, and strongly put together.

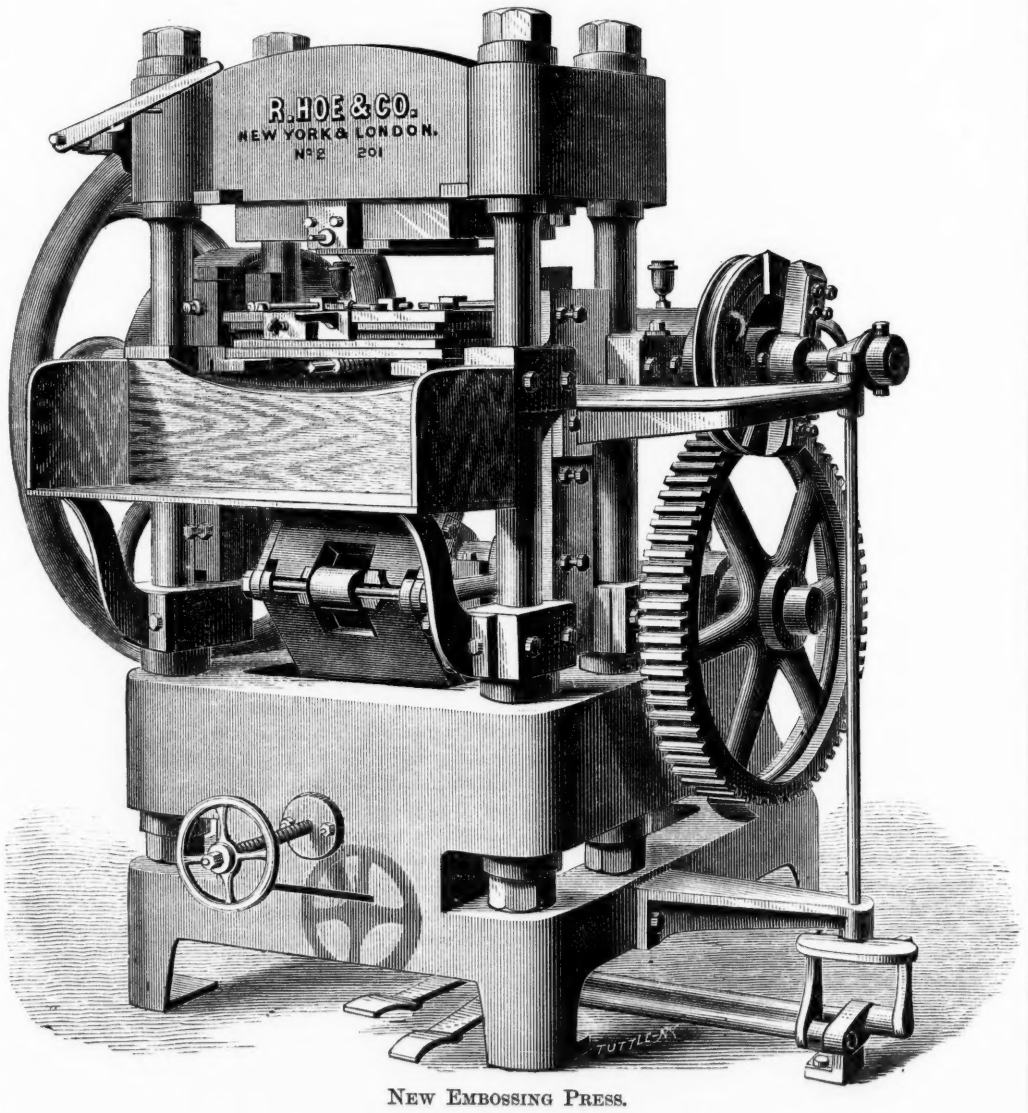
The bed is guided by the frame, so that a heavy impression can be had at either corner of the platen without tilting.

The feed-guides on bed are adjustable in either direction, and specially adapted to good color work.

In this press the manufacturers have done away with the cam for dining the toggle, and substituted a crank motion which is noiseless, and, by means of a patent friction clutch, operated by treadles, the bed can be stopped and started at any part of its stroke. This is an entirely new feature with a machine of this description.

The bed is constantly in motion, and, in order that no time may be lost, it is given sufficient travel to enable the operator to place on and take off the work without stopping the machine and without danger to the operator.

The inking attachment, which is furnished with press, when desired, is simple and complete, and consists of an ink fountain with an adjustable knife, two form rollers and five distributing rollers, with a distributing cylinder, making it specially adapted for doing, at one operation, the heaviest kind of stamping and inking.



NEW EMBOSSING PRESS.

The cut on the opposite page represents a new pattern of Hydraulic Press used for baling cotton, bagging, rags, or any kind of merchandise.

The ram and cylinder are placed, as shown in the cut, below the floor, so that the platen of the press is on a level with it, and the goods to be baled are trucked into position, thus avoiding any heavy lifting. The platen and head of press are grooved, to allow the bands to be placed and fastened around the goods after they are sufficiently pressed. These presses can be made to do any kind of baling, and the one represented in cut is especially for pressing bags into bales, and is extensively used in this country,

The cylinder of press is of solid wrought iron and lined with copper. The rods are forged from picked scraps. Both the above described machines are manufactured by R. Hoe & Co., New York and London, England.

An old gentleman says his boy is the champion light wait of the country, for the gas is kept burning in the hall every night for him until one o'clock.—*Am. Grocer.*

Machine Shop Wages in Europe.

We have made the following extracts from the recent volume published by the U. S. Government on "State of Labor in Europe." The tables of wages have been carefully collected by the U. S. Consuls in the several countries, and may be taken as reliable. It will be noticed that in a few European countries machinists are paid as well as in some parts of the United States, though we would not advise any of our skilled mechanics to emigrate this year.

Brussels, Belgium.—Machinists, $22 to $38 a month; blacksmiths, 48c. to 96c. a day—assistants, 48c.; coppersmiths, 48c. to 96c. engineers, 48c. to 96c.—assistants, 40c. to 48c.; model makers, 60c. to $1.

Copenhagen, Denmark.—Iron turners, 65c. a day; blacksmiths, 65c.; gunmakers, 70c. per day of 12½ hours.

Bordeaux, France.—Metal turners, 80c. to $1 a day; boiler makers, 80c. to $1; blacksmiths, 50c. to $1; plumbers, $1 to $1 20.

Paris, France.—Metal borers, 90c. to $1.30 a day; blacksmiths, $1.30 to $1.80; coppersmiths, $1.10 to $1.80; metal turners, $1.20 to $1.40.

Rouen, France.—Blacksmiths, 58c. a day; carpenters, 69c.; plumbers, 65c.

Barmen, Germany.—Machinists, 51c. to 71c. a day; coppersmiths, 59c. to 71c. a day; iron molders and boiler makers, $4.64 a week; day laborers, 47c. a day.

Chemnitz, Saxony.—Machine builders, $4.17 a week; planers, $4.28; founders, $3.78; blacksmiths, $4.05; safemakers, $4.

Frankfort-on-the-Main, Germany.—Machinists, $7 to $8.50 a week, ten hours a day; blacksmiths, with board, $1.40 to $1.90 a week; day laborers, $2.80 to $3.50.

Hamburg, Germany.—Machinists, 76c. to 99c. a day; blacksmiths, 65c. to 83c.; painters, 76c. to 95c.

Falmouth, England.—Machine fitters, $1.32 a day; molders, $1.20; laborers, 80c.

Leeds, England.—Machinemen, $6.72 to $7.68 per week of 54 hours; pattern makers, $8.16; blacksmiths, $7.20 to $7.68; engineers, $7.20 to $7.68; boiler riveters, $7.32.

Liverpool, England.—Iron turners, $7.80 a week; fitters, $7.90; molders, $8.25 to $8.75; pattern makers, $8.25; boiler makers, $8.50; planers, $6.78; blacksmiths, $8.75; platers and anglesmiths, $9.25 to $9.72; engineers, $8.25.

Holyhead, Wales.—Boiler makers, $6.80 to $8,25 a week; blacksmiths, $6.80 to $7.75; mechanical laborers, $4.40 to $5.60.

Newcastle-on-Tyne, England.—Turners and machinemen, $5.04 to $8.16 per week of 54 hours; boilersmiths, $5.52 to $8.64; fitters, $5.04 to $7.68; foreman of shop, $10.08 to $18.00; blacksmiths, $6.72 to $8.16; brass molders, $5.76 to $7.92; brass finishers, $7.44 to $7.92; engineers, $7.92 to $10.80.

Sheffield, England.—Machinists, $5.82 to $8.76 per week; molders, $8.74 to $9.72; forgemen, $12.15 to $18.24; engine fitters, $8.25; spring fitters, $9.72; brass founders, $8.25; brass finishers, $7.77; boiler riveters, $7.53; flangers, $8; blacksmiths, $8.50; pattern makers, $8,26 to $8.74; file forgers, $8.52; file grinders, $10.94 to $13.38; saw grinders, $12.12 to $14.58; forgers on pocket cutlery, $5.82 to $10.94; engine men, $6.78; apprentices, $1.20 to $3.36; laborers or helpers, $4.86.

Cork, Ireland.—Machinists, $1.09 a day.

Leith, Scotland.—Iron molders, $7.20 to $9.50 per week of 51 hours; blacksmiths, $4.55 to $7.68; brass founders, $3.70 to $8.50; engineers, $4.55 to $7.68; laborers, $4.50 to $6.20.

Dundee, Scotland.—Machine and engine fitters and finishers, $6 to $6.50 a week of 51 hours; molders, $7 to $7.50; boiler makers, $6.75 to $7.25; blacksmiths, $6.50 to $7; iron turners, $6.50 to $6.75; pattern workers, $7 to $8; laborers, $4 to $4.75. Foreman gets $1 to $1.50 a week more than ordinary workmen.

Glasgow, Scotland.—Machinemen, $6.48 a week of 51 hours; brass molders, $7.56; coppersmiths, $7.56; iron finishers, $6.48; riveters, $6.48; pattern makers, $8.10; blacksmiths, $6.48; laborers and helpers, $4.32; engineers, $7.56.

Cardiff, Wales.—Engine fitters, $6 to $10.50 a week; boiler makers, $1 to $1.40 a day; engine drivers (with premiums for merit), $1.25 to $2 a day.

Florence, Italy.—Machinists, $1 a day; blacksmiths, 80c.; carpenters, 85c.; common laborers, 40c.

Genoa, Italy.—Blacksmiths, 58c. to 76c. a day.

Messina, Italy.—Machinists, $1.20 a day; blacksmiths, 70c.

Rome, Italy.—Master machinists, $60 to $80 a month; master finishers, 70c. to $2 a day; master founders, 50c. to $1.60 a day; master forgers, 80c. to $1.20.

Rotterdam, Holland.—Machinists, 80c. to $1.40 a day; molders, 80c. to $1.20; blacksmiths, 60c. to $1.

Barcelona, Spain.—Machinists, $1 to $1.50 a day of ten hours; iron founders, 60c.; blacksmiths, 70c. to 80c.

Geneva, Switzerland.—Skilled mechanics, $2 to $2.50 a day; ordinary mechanics, 60c. to $1.20 a day.

A press dispatch dated Reading, September 2, says: "The Reading Hardware Company and their striking moulders have at last agreed upon a proposition to resume work. These men went out on July 12, and have several times tried to compromise, but without success until to-day. The Hardware Company offers the men an advance of 15 per cent. on the wages paid when they struck, to continue during September and to be increased to 25 per cent. on and after October 1, the men to begin work on or before September 8. After a discussion the proposition was unanimously agreed to, and the men will go to work to-morrow.

A well-known statistician of this city, says the Philadelphia *Trade Journal*, asserts that fully 20,000 more people are employed in Philadelphia to-day than on September 1st of last year. This opinion he bases upon an investigation into the condition of Philadelphia's industries, extending over a period of several weeks. Every business in the city, he says, with scarcely an exception, is feeling the effects of the trade revival, and according to present prospects, there is in store for both employers and employees a tide of prosperity such as has not been experienced for many a long year. There is quite an active demand for workmen in the iron and machinery works, as well as in the foundries, rolling establishments, and hydraulic works. All these places, large and small, are filled with orders, and in several instances the supply of workmen is unequal to the requirements of the shop.

The new Artisans' Dwelling Act in England makes it imperative that wherever improvements are made by tearing down defective houses, the land shall be sold only on the condition that the purchaser shall build new and healthy houses sufficient to accommodate the dispossessed tenants.

It is reported that the Russian Government is making a contract with American ship builders for the construction of a number of ocean Corvette cruisers, to cost nineteen and a half millions of dollars. The contract, if completed, will probably be awarded either to Cramp & Sons, Philadelphia, or to John Roach & Sons, Chester, Pa.; in either case giving employment to several thousand mechanics.

It is said that M. Hippolyte Fontaine's opinions have been supported so universally, in condemnation of Edison, that it is now suggested that the patented and published discoveries of the latter are only a "blind" to conceal his movements, and that he is really working in some other direction.

A Battle Creek, Michigan, firm have invented and tried successfully a steam engine to run a threshing machine. The peculiarity of the machine is that it uses straw as fuel. The straw is fed into the fire pan through two rollers by a small boy. It requires about 100 pounds of straw to thresh 100 bushels of wheat. With this engine 500 bushels of wheat have been threshed in three hours and forty-five minutes. The cost of the straw as compared with wood or coal is only about one-tenth, while the heat is much greater, and the liability to fire not so great, as no sparks are emitted from the engine.

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☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

NEW YORK, SEPT. 20, 1879.

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The fall business opens favorably, with most machine shops, foundries and boiler works supplied with orders.

Special.

We wish to make the following facts fully understood by our readers:

1st. That nobody has ever paid the publishers of the AMERICAN MACHINIST one cent for anything inserted in its reading columns, either for illustrated descriptions of machinery and tools, contributed articles, editorials, manufacturing notes, book reviews or reviews of shop supplies.

2d. That we never will publish any notice for pay, either direct or indirect, except in our advertising columns.

3d. That no party interested in making or selling machinery, engines and boilers, or in their manipulation has, or ever has had any pecuniary interest in the AMERICAN MACHINIST.

Co-operation versus Centralization.

Any careful observer of industrial progress during the last decade cannot help being impressed with the strong and growing tendency toward centralization of power in the hands of a few individuals—not of political power, for that is too unstable and ephemeral in this free republic to cause serious apprehension in the minds of self-thinking men—but of commercial power, which is paramount to political prestige, inasmuch as it commands even the sustenance of myriads of dependents. Railroad management has been gradually drifting into the control of a few universally-recognized magnates—the Scotts, the Vanderbilts, the Garretts and a few others—whose slightest whim may affect the well-being of ten thousand subordinates. In some localities manufacturing and mining operations are centralized under the autocracy of a few wealthy individuals. For examples we need only mention the Bonanza Kings of the Pacific Slope, Mackey, Flood, Sharon, Fair, &c., and the two or three dominant families of Fall River, who, with "their sisters, their cousins and their aunts," rule absolutely nearly every important productive and financial business in the city. That the possession of such concentrated power does not have a salutary effect upon the moral and material prosperity of a State, or a community, has been plainly shown in the history of the above-mentioned city for the last two years. Two or three uncles and nephews of a ruling house have changed their residence to a stone castle, owned by the State, and other scions of the same stock are spoken of as likely to transfer their headquarters to the halls of the same edifice. Meanwhile the workers, whose labor has brought into existence the wealth owned by these exalted families, are waging a commercial war against their masters to secure a larger share of the unconsumed profits of their daily toil.

But, it being admitted that the public good is not best subserved by centralization of commercial power—the commanding influence of wealth—what shall we do to check this growing tendency so clearly to be seen? We have no sympathy with that rabid school of political economists who desire to fix a limit, by governmental authority, to the growth of private industrial enterprises. Such an enactment would be in the highest degree antagonistic to the spirit of our free institutions, which permit a man to rise from the most humble position to the highest pinnacle of commercial success. Neither have we a grain of comfort to throw to the centralists, who would, by law, restrict the upward progress of the poor but ambitious laborer. If government tutelage must, in any instance, be invoked, let it incline to the working people, for the true theory of government is, to secure the greatest good to the greatest number. It must be evident, however, both to the workman and the employer, that not to the Government, but to themselves, must they look for any important improvement of their condition. It is exceeding difficult, and always unsatisfactory in its results, to fight centralization single handed. In union there is strength. A few years ago, the railway power, gravitating into the hands of a few leaders, was viewed with much alarm and grave apprehension. The question was anxiously canvassed whether any force, short of government control, could offer any strong obstacle to its dreaded encroachment upon the people's rights. The great agricultural interest seemed to be the particular prey of centralized railroad dictation. It was then the Granger movement sprang into existence, and, in a few months, confronted this increasing power with a might it was compelled to recognize and treat with respect.

Although the Granger movement failed in many of its most important measures, who shall say that it has not exerted a salutary influence upon centralization of railroad power? The great petroleum oil industry is suffering severely from the centralization of power in a single wealthy corporation—the Standard Company. Small oil producers are almost at the mercy of this dominant oil-ocracy. We are squarely confronted with the question as to how this absorption of minor industrial enterprises by the greater, and the gathering of excessive commercial power into the hands of a few individuals, can be checkmated. The only means visible to us is the co-operation of both wage-laborers and employers with limited means—of the former to establish workshops of their own, and of the latter to repel the aggression of centralized power. The evils of trade-unionism and strikes on one hand and soul-less domination of industrial power on the other, can best be reduced to narrow limits by the active encouragement of co-operative manufactures among mechanics. This course would tend strongly to raise the average grade of skill among workmen, as the possession of high capabilities would not only insure the admission of an individual to a co-operative society, but would permit his taking a more satisfactory position when admitted. Drones and indifferent workmen would then be made to realize their true level, and would make efforts towards improvement, not having employers (shop-owners) to blame for keeping them down.

A vigorous growth of co-operative manufactures would also tend to promote thrift and sobriety among dissolute workmen, as nothing can appeal more eloquently to the honor and ambition of an artisan than an enlarging opportunity for his rapid advancement. In Germany, where co-operation is most widely extended, drunkenness and profligacy among workmen are less prevalent than in other European countries. With the co-operative principle fully recognized among the industries of this country, the main-stay of centralization, viz., *a strong control of workmen's means of subsistence*, would be superlatively weakened. Every day brings fresh evidences that this principle is being made available by enterprising mechanics, and we look for its continual progress.

We are pleased to note, from personal observation, that Prof. R. H. Thurston, of the Stevens Institute, Hoboken, N. J., is slowly but surely improving in health, though it will be still some time, probably, before he will be restored to full activity of mind and body. Among other articles by the same author, the readers of the AMERICAN MACHINIST remember with pleasure and profit Prof. Thurston's article on "Sizes of Safety Valves," published in one of our early issues.

A noteworthy feature of the steady demand for all the back numbers of the AMERICAN MACHINIST, aggregating often 100 copies daily from scattering sources, is the special inquiry for the December number of 1877, containing, among other original matter, an article from the pen of the gifted young engineer, Theron Skeel, since deceased, entitled "Methods of Setting Boilers in Brickwork," showing that this topic holds a prominent place in the minds of the machinery public. We commend its further consideration to those among our readers who have had practical experience in this direction.

The Railroad Investigation.

A valued editorial friend bespeaks our attention to the controversy now pending between the New York jobbing houses and the railway companies of the State, as exemplified in its present investigatory phase, before the legislative committee.

We have not been accustomed, either from training or habits of thought, to look upon railway companies as injured innocents, nor have we so far discovered that they are liable to become such in the course of this investigation. The American system of railway government is too entirely personal and autocratic in its methods to lack either means of self defense or of encroachment upon the rights of others.

Exactly what the committee or its promoters hope to accomplish, however, does not yet appear, the probabilities being that the tangible results achieved will fall far short of the hopes of the achievers. While the full accountability of such corporations to the public, not only as common carriers but as enjoying valuable privileges and perfect protection, must be conceded even by themselves as entirely proper, the fact should not be lost sight of, that an attempt to bind down the railroads of New York State, for example, to strict regulations, from which competing roads in other states are free, is not only unjust, but is an application to railroad business and consequently to the business interests of the general public, of the very principle of *discrimination*, of which the investigators complain:

We take it, therefore, that so far as this principle is concerned, the chief gain to be derived from the pending investigation may be summed up under one or both of the following heads, viz., obtaining data for the guidance of future (National) investigators, and information that will lead to the improvement of the State canal system. The chief officer and owner of the greatest trunk line has avowed his entire willingness to submit to the workings of an equitable system which shall be national in its character, and it should be remembered that the balance sheets of none of the great railway corporations can be fully made up until the net earnings of their distant branches in other states are noted.

One great error that has practically nullified previous attempts in this direction by other States, has been the *administrative* character of the proposed legislation. Instead of a few simple boundary lines, beyond which railroad authority should not pass, and back of which the corporations should remain free, some of the Western States failed of their object by practically endeavoring to assume the management of the roads in all points of detail, and, as a result, in central Iowa, for example, the farmer to-day receives only 16 cents per bushel for his corn, and the railway companies exact an equal amount (16 cents per bushel) for carrying it to Chicago.

So far as the present investigation can be turned to account in unearthing past corruptions and preventing like misdeeds in future, upon the part of railway managers, nothing but good can come of it; but, after all, what right have the jobbing and importing merchants to complain of the principle of discrimination in rates, if based upon the quantity of business to be done? Is there one of them that ever thinks of adopting any other policy in his own private business?

What is required to meet the public need is a national policy, not of administrative, but of restraining legislation, which shall cover all the railway systems of the country, and which shall not attempt to say what the corporations *shall* do, but shall be content with stating the things that they shall *not* be permitted to do. Such a policy, if divested of political significance and well considered as to detail, while benefiting the general public by establishing stable methods and preventing ruinous railway wars, should have no warmer friends anywhere than among stock and bondholders and trustworthy railway officials.

Letters From Machinery Establishments.

We have published, from time to time, specimens of the letters which we are constantly receiving from machinists, engineers, etc , in which the writers express their views regarding the work that the AMERICAN MACHINIST has done and is doing. We now take occasion to print a few sample letters received from machinery firms, who in beginning or renewing their subscriptions, have taken the trouble to put their opinions in writing.

In this connection we might mention a curious circumstance that we have invariably observed, viz.: that copies of the AMERICAN MACHINIST are seldom found lying about the desks and offices of subscribers, the explanation being that immediately upon its arrival it is *taken home* for more careful reading, and in most cases bound up for future reference, a fact which pays a handsome compliment to the practical qualities of the paper.

PUBLISHERS AMERICAN MACHINIST:

Gentlemen:—I subscribed for your journal for 1879, and the price having been increased by the change to a weekly, enclose two dollars for balance due from me for this year. I take the oppoptunity to congratulate you on the success of your paper, which really fills a want long felt by practical men.

Yours truly,
J. F. HOLLOWAY,
Pres't and Sup't Cuyahoga Steam Furnace Co., Cleveland, O.

AMERICAN MACHINIST PUBLISHING CO.:

Gentlemen:—I like your paper. I note your reference on page 10 lately to "Notorious Shoppers." We all have them to contend with. I wish the telephone cut-off was in more general use among dealers. I shall be pleased to send you items of interest, from time to time, if I can only think of it.

Respectfully yours,
O. L. PACKARD,
Dealer in Iron and Wood working Machinery, Engines, Boilers, Supplies, etc.,
Milwaukee, Wis.

GENTLEMEN:

In addition, please inform me when my subscription will expire. I wish to continue your very interesting paper, but am in the dark as to how we stand. Very truly,

GEO. W. FISHER, Supt.,
Fulton Iron Works,
Cor. Second and Carr sts., St. Louis, Mo.

AMERICAN MACHINIST PUB'G CO.:

Gentlemen:—We like your paper very much, and if you will please send us bill of what is due, we will remit. Send at the same time Mark Flather's bill, and oblige,

Yours truly,
FLATHER & CO.,
Manuf'rs Tools and Machinery, Nashua, N.H.

GENTLEMEN:

Please send three copies of AMERICAN MACHINIST to Benj. Eastwood, Paterson, N. J., and names enclosed, for which I enclose check. Wishing you every success in your enterprise, as it supplies a want long needed.

Yours, etc.,
BENJ. EASTWOOD,
Manuf'r Silk Machinery, Paterson, N. J.

GENTLEMEN:

Your paper has suited me so well, being the only one devoted to the machinery business exclusively, that I look for its arrival with pleasure, well knowing that each number will contain valuable information.

Respectfully,
W. M. CALDWELL,
Golden State & Miners' Iron Works,
237 First St., San Francisco, Cal.

AMERICAN MACHINIST:

Please find enclosed $3.00 for one year's subscription to your journal. Send the back numbers of this volume. If you have any posters, send us one, and we will put it up in our shop for the benefit of our men. Truly,

LANE & BODLEY CO.,
Cor. John and Water Sts., Cincinnati, O.

AMERICAN MACHINIST PUBLISHING CO.

Gentlemen:—In enclosing check for a year's subscription for the AMERICAN MACHINIST, allow me to say I consider your paper a valuable contributor to the science of machinery and engineering. Your change from monthly to weekly is a great improvement, and one that can hardly fail to be appreciated. Very truly yours,

FRED. S. BENSON,
Engineer Nassau Gas Light Co.,
Brooklyn, N. Y.

DEAR SIR:

Your postal card of Aug. 29th was duly received

I have been taking the AMERICAN MACHINIST right along.

I have no cuts of the Dynamo, but expect to have some soon, and will remember your request. Yours truly, T. A. EDISON,
Menlo Park, N. J.

AMERICAN MACHINIST PUBLISHING CO.

Gentlemen:—I have received from Mr. Dunning, of Geneva, N. Y., a copy of the MACHINIST, and am highly pleased with it. Can I have all the back numbers from the first? If not, how many can I get, together with a binder to keep them in order? Please answer by return mail, and consider me as one of your subscribers. Yours truly,

WM. REID (of REID & BARR),
Hamilton Iron Works,
Rebecca St , Hamilton, Ontario.

A Naughty-cal Affair.

The *Nautical Gazette*, of Park Row, in this city, being put into commission to do duty for the naval cadet engineers, spreads its little sail, fills with wind, trains its six pounder, and bears down upon our position in the following bellicose style:

"An article in the AMERICAN MACHINIST, of the 23d of August, under the caption of 'Kid Glove Naval Engineers,' contains statements so utterly untrue regarding the present organization of the U. S. Naval Engineer Corps, that we must contradict it, especially as we have taken pains to obtain the views of some of the older naval engineers upon the subject.

'The writer, in the beginning of his article, states correctly the requirements for admission, and the system of education pursued at the Naval Academy for cadet engineers, then calls this one side of the case, and assumes another view so consummately at variance with possible facts as to carry conviction of its worthlessness to any engineer, and calls this the other side.

"First he says: 'The boys are admitted at the age of sixteen,' and then asks, 'what boy could pass a rigid examination at that age? and this debars the young man of riper years from entering the U. S. Navy as an engineer, though he may have acquired an education in some other institute equally as good.' This statement and the accompanying comments fall to the ground, because, in reality, the age is not limited to sixteen, but candidates are admitted until twenty years of age, and very many of those who enter the Naval Academy are already graduates of such institutes as the 'Stevens,' 'Van Renssalaer,' etc."

The skipper of the N. G. starts off splendidly, but he takes so much pains "to obtain the views of some of the older naval engineers upon the subject," that we fear he is slightly confused in his reckoning, and in danger of running foul of a reef before he gets into deep water.

The old engineers, being subject to the young cadets, are not likely to advance any ideas unfavorable to the latter in the presence of one known to be an especial advocate of the cadet system and its operations. The real views of old naval engineers upon the cadet system are pretty well understood by those familiar with naval affairs. We stated that candidates are admitted to the naval school at the age of sixteen, but did not assert that this was the limit. According to the rules, they are admitted from sixteen to twenty; according to actual practice, under the patronage system, they are admitted as soon as it is possible to get them in. As we remarked in the article in question, "cases are on record where not only whole families have been wedged into the service, but children raised particularly to fill these positions." The parties who control the examinations have the power in their own hands, and use it to suit their inclinations. If, as the N. G. skipper sets forth, "very many of those who enter the Naval Academy are already graduates of such institutes as the Stevens, Van Renssalaer [supposed to mean the Renssalaer Polytechnic Institute], &c.," we pity them, as their time is as much wasted as it would be, after such graduation, to enter a village academy for four years. But the only chance a young man has to become a chief engineer in the navy, even after graduating from such an institution, is to pass through a four years' course with the youngsters at the Annapolis Naval Academy. The navigator of Park Row takes us to task on the matter of bouncing cadets for deviltry. He says: "Statistics show that since the system was inaugurated but one has failed from causes connected with conduct." Statistics, like the examinations, are under the control of political wire-pullers, and the bouncing, like other matters, under political direction, gets nicely covered up immediately after it takes place.

The mariner of the N. G. next takes another tack, and leads off like this:

"The following statement, 'that the object of creating the position known as machinist was to crowd out the old engineers, or to abolish the engineer corps,' is undoubtedly true, but has so far failed, that it has increased enormously the cost of coal and stores to maintain a vessel in commission, besides destroying all reliability in the recorded data of the engine-room, and has doubled the cost of repairs. In fact, several cases have occurred where perfectly efficient machinery has been completely destroyed in a few months. One vessel had her condenser broken in pieces from coupling the shaft, whilst under sail, without opening the necessary valves; and, very recently, another ship, in good condition, was disabled in six weeks, her boilers filled with scale, and cost ten thousand dollars to repair, solely from a lack of proper engineer officers to keep the regular watches."

This agrees perfectly with what we had previously written, and it might seem a little strange to an uninformed party that the old engineers should manifest any admiration of a system introduced to crowd them out.

Our salt-water critic follows up with the assertion that "the present method of educating engineers was inaugurated by Secretary Welles when its necessity had been long recognized by engineers in the navy." Tell that to the marines, for Secretary Welles during the war acknowledged the superiority of the engineer system, and there were few accidents compared with what occur at the present time with our diminished navy. In common with all who wished to improve the navy, Secretary Welles aimed to secure the better education of engineers, but to charge the present execrable system to his planning is a feeble attempt to fix its responsibility upon one whose memory is held in high esteem, thereby striving to bolster it up in popular estimation.

After floundering about in a fog for some time, the N. G. navigator brings his gallant bark to the defense of the cadet youths by declaring that, after a certain amount of experience at sea, they are "probably the finest type of marine engineers in existence." The "finest, etc.," would doubtless make valiant engineers for H. M. S. Pinafore, but thus far, in having charge of the steam machinery of our naval vessels, they have gained more notoriety than honorable distinction.

The man-of war of the present day is a mass of machinery; the days of sails are gone, and the naval battles of to-day are fought by steam. Therefore, the practical engineer should be placed in command of the machinery. We are in favor of the education of practical engineers, and, as we have frequently asserted, the combination of theory and practice is the only requisite to make the best engineers. We hope that the day is not far distant when every vestige of corruption will be removed from the Naval Academy, and instead of being a nursery and training school for the sons of influential politicians, it may become a school second to none in the world. If these juvenile C. E's., as now graduated, must be sent out at sea, where spanking breezes blow, let them be under the watchful care of experienced engineers, who can safely be trusted with the machinery.

Our attention has been called to an advertisement in the *N. Y. Hera'd* of Sunday morning, August 31st, containing what purports to be an editorial extract from the AMERICAN MACHINIST, which reads (the italics being our own) as follows:

"These machines are *destined* to take the place of all forms of foot and hand presses heretofore used for punching and shearing bar and plate iron, readily doing work many times heavier than has been considered possible for any but large power presses to perform."—(From editorial comments and illustrations in AMERICAN MACHINIST.) Peerless Punch and Shear Company, 52 Dey st.

We never used the foregoing language in the AMERICAN MACHINIST, editorially, or otherwise. The article from which the extract purports to be taken was an illustrated description of the presses made by the above company, and occurred in our last issue, reading as follows:

"The machines, illustrated upon this and the opposite page, are designed to take the place," etc.

Which is a wording essentially different, as any one can see.

Business Specials.

Thirty cents a line for each insertion under this head.

The Huntoon Steam Governor Co., of Lawrence, Mass., warrant a direct saving in steam of from 10 to 20 per cent. over any other Governor known; while for quick and accurate regulation, great durability and lasting economy in use, they guarantee results never before attained by any other. See advertisement.

Brown & Sharpe M'f'g Co., Providence, R. I., keep in stock at reduced prices Patent Cutters for the teeth of gears which can be sharpened by grinding without changing their form. All wheels of same pitch cut with them will run together correctly. Send for new catalogue.

National Steam Pump, simple, reliable and durable. Send for illustrated catalogue with reduced price list. W. E. Kelly, New Brunswick, N. J.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1.) A subscriber wishes to know through your questions and answers how the duty of Pawtucket engine is done by figures, raising so many millions of pounds, one foot high, for every hundred pounds of coal? A. The desired information may be found in article on "Duty of Pumping Engines," by John W. Hill, M. E., in AMERICAN MACHINIST for August, 1878.

(2.) Apprentice, Knoxville, Tenn., asks: Will you inform me through your valuable paper which is the best book published on mechanical drawing? A. The Engineers and Machinists' Drawing Book, by Blackie & Son, Glasgow, is considered by draughtsmen to be a first class work on the above subject. 1 Vol. 4to, half morocco, price $17.50, or the Practical Machinists' and Engineers' Drawing Companion. By Wm. Johnson, price $10.00.

(3.) L. B., Damascus, Wayne Co., Pa., writes: I have a small engine of 10 H. P., and quick motion, running 240 revolutions per minute. Everything works nice and smooth except the pump. I lift water about 10 feet, and, when pumping, the noise of the valves is very annoying, If I turn the stop valve, which regulates the supply of water, a very little, say ⅛th of a turn, I manage to get along, but if I increase it the noise and pounding of the valves is so heavy that I am forced to lessen the amount, as I fear, if continued, something might give way. 2. Is this action peculiar to engines thus situated? A. If you have no foot valve on the bottom of feed pipe it is best to put one there, as the valves in the pump will be relieved from the extra work of holding the column of water in the pipe. You should have given the diameter and stroke of the pump plunger, also examine the valves to see if they have a proportional lift to each other. The bottom valve in the pump should have the least, and the check valve the most. For instance, on passenger locomotives, where the pump plunger is 2 inches in diameter and 24 inches stroke, the bottom pump valve usually has ⅛th inch lift, the top valve 3-16 inch, and the check valve ¼ inch. If by the foregoing precautions you fail to stop the noise, we then recommend you to place an air chamber on the feed pipe, by placing a T coupling between the bottom valve and pump; said chamber may be made of the same size pipe as the feed pipe, the capacity should be equal to that of the pump. We have known cases where these difficulties have been successfully overcome by the insertion of a small stop cock in the feed pipe, and the admission of a small quantity of air, which will destroy the solidity of the water. 2. It depends upon the construction of the pump and conditions under which it is worked.

LITERARY NOTES.

MECHANICAL HUMOR: A collection of original anecdotes connected with engineering and other mechanical matters. Crown 8vo., 75 cts., by J. Richards, M. E., author of "The Principles of shop manipulation," &c. Published by Richards and Atkinson. 615 Walnut St., Philadelphia, and sent post free on receipt of price.

There is no reason why the practical mechanic should not enjoy a little quiet fun as he goes along, as well as anybody. He will be none the worse workman, or student, for liking and taking a little diversion occasionally, and it is all the better if he should develop the faculty of finding amusement in the matters of daily occurence in the line of his trade.

The little book before us contains 150 pages of original anecdotes or incidents gleaned by the writer from his own experience, which, while not remarkably humorous, are yet interesting, and not altogether without suggestive value. "Mechanical Anecdotes," or something similar, would, perhaps, have been a more felicitous title. The greatest fault to be found with the book is a certain diffuseness, and tendency to moralizing, which mars many of the articles. We append extracts from one of the papers, which will convey perhaps a clearer idea of the scope of the book than any written description:

"I remember an old workman named Grimes, an eccentric, even tempered man, who was systematic and regular in all that he done; for him to have been absent for a day, or to have been connected with any accident or irregularity, would have been an event in the works. Grimes was never known to be angry, always came in precisely two minutes before starting-time, hung up his hat and coat on a particular peg, adjusted his spectacles, and finished fastening his apron just as the shaft made its first revolution.

'Grimes had charge of the steam-heating apparatus; kept a curious watch-clock in repair that no one else understood; made the small shop tools—in short, his business was to perform what the rest could not do.

"No one ever questioned Grimes' ability to perform 'anything.' The superintendent would send for Grimes to repair a combination lock on the office vault, and he would proceed to the work just the same as though it were to mend a door-latch. If the engine required repairing, Grimes did it; if the boilers leaked, Grimes patched them; if a wooden model was wanting, Grimes took it in hand. He was, in short, indispensable, and performed his work without instructions from any one.

"In addition to the many duties devolving on Grimes, some of which have been named, he filled the important post of 'scapegoat' to the works; all that went wrong, for which there was not an author at hand, was blamed on Mr. Grimes. 'I am quite willing,' he would say, 'to take the blame, if the rest are ashamed of it.' There was a kind of quiet sarcasm about this expression, always repeated when occasion called for it; yet we all felt that Grimes told the truth, so far as a willingness to assume the faults of others. If a tap was broken, or a wrench mislaid, 'Mr. Grimes!' would be the cry. Mr. Grimes had it! and so the matter was disposed of, and this, which was at first a piece of pleasanty, finally became an important matter as the sequel will show.

"Grimes was one summer called away for a time, and was missed during the first hour. Evidently there was one element wanting in the works; one tool was broken, another lost; the oil-tap had been left open, and, with Grimes away, no one to blame. The first day convinced every one that without Grimes all would soon be confusion. At the end of a week the manager wrote to him, earnestly requesting him to come home, that 'everything was going wrong, and no one to take the blame.' Soon old Grimes' hat was in its place again, and a feeling of relief was felt by all. "Order reigned in Warsaw" once more.

One of the most creditable technical publications that has been started for many months is the *Holyoke Manufacturer*, a bright, lively, and neatly printed monthly. The first issue, August 1879, contains a large amount of manufacturing and trade information in various branches of business.

One of the most notable articles that we have published is from the pen of a young man only 20 years of age, at present residing in the West, who has made the study of mechanical engineering his business, and now writes us to say that he desires to obtain a position in some good machine works for the purpose of learning the trade practically, the drawing room and the machine shop being the departments desired. Has a good taste for designing and has made considerable advancement in mechanical drawing. If any of our friends wish to communicate with him, we shall take pleasure in giving his address.

MANUFACTURES.

Work on the new silk mill at Leeds is well under way.

Marinette, Wisconsin, is to have a paper mill. It will cost $40,000 and employ fifty men.

The new rolling mill of the National Tube Works Company, at McKeesport, Pa., has just been completed.

Simpson, Hall, Miller & Co., the Connecticut firm, are to start a factory at Montreal, Canada, under the superintendence of J. B. Kendrick.

The new grape sugar manufactory at Peoria, Ill., rapidly approaches completion. The dimensions of the structure are 200 feet long, 104 feet wide, and 93 feet high, to which is added a boiler-room 90 feet long, making the entire length of the building 200 feet. The establishment will have a capacity for the conversion of 6,000 bushels of corn into sugar and syrup daily, and, when completed and in operation, will give employment to 250 men. To accommodate this increase in the population, and give them a home near their work, a small village is being built in the vicinity. It will contain about thirty small dwelling houses, and a commodious boarding-house. It is expected to have the establishment finished and running in thirty days.—*Boston Commercial Bulletin.*

The Buckeye Machine Shops, Salem, Ohio, are running 125 hands night and day, and Woodruff's Stove Works are so busy that they have to build an addition to their already extensive works. It is said the town was never more prosperous than at present.

The Massillon Bridge Company, Massillon, O., have just completed a large new brick work-shop, and are full of orders for various parts of the country.

G. F. Eberhard, Akron, O., has been compelled to enlarge his establishment by the erection of a new and commodious building.

The Cleveland (O.) Tube Works, which have been idle for some time, will be started up soon.

The railroad shops at Altoona, Pa., now employ about 2,800 men.

The Warren (O.) Machine Works are working extratime, 100 hours per week. They are crowded with orders for portable engines and saw-mill work.

Rice Bros., of Worcester, are about to start a factory at New England Village for separating the wool contained in old carpets from the cotton.

License to organize has been issued to the Tippecanoe Paper Company, of Chicago; capital, $100,000.

The Albany & Rensselaer Iron and Steel Company are now working 2,600 men, and turning out 250 tons of steel rails daily, besides a vast amount of other work.

The Mount Vernon Cotton Duck Mills near Baltimore, Md., are being extended by the addition of a new building 150 feet in length, the new building, together with the machinery, to be ready for work in a few days.

The National Tube Works, McKeesport, Pa., are running full time, and are shipping oil tubing to Russia.

The Holyoke Machine Works, Holyoke, Mass., are running full time, employing 250 hands. They make a specialty of paper machinery, turbine water-wheels, and the Deane Steam Pump.

The American Bolt Company, Lowell, Mass., are running full time, and produce about seventy-five tons per month of bolts, nuts, etc., which are exported to some extent.

The Phœnix Chain Works, Chicago, are running full time, with orders ahead.

The Lowell Machine Shop has over 800 names on its pay-rolls at present, and is running full time. It is reported that a large contract for milling machinery has been awarded to this establishment.

The United States Cartridge Company, of Lowell, Mass., are engaged in filling an order for a million cartridges for the Government, and the works are running full time.

A party of Boston capitalists are about erecting a large cotton mill at Springvale, Me., which will give employment to a large number of hands.

Mr. Jerome Wheelock has the contract for a new 150-horse power engine with 18-inch cylinder and 45-inch stroke, for the Warren Thread Company, to be used in their new establishment at Ashland.

The Ashcroft Manufacturing Company, 51 Sudbury Street, Boston, are over two months behind on orders for steam gauges. They are shipping goods of their manufacture to all parts of the country, Europe, South America and the West Indies.

The Consolidated Safety Valve Company, 53 Sudbury street, Boston, are furnishing valves to all the principal locomotive builders and railroad companies in the country.

The Ohio Bridge & Iron Works, formerly at Lancaster, O., are putting up new shops at Urbana, O.

The Speed Recorder Co., have decided to build new shops at Kent, Pa., at a cost of $6,000.

The hours of labor at Colt's armory, Hartford will be increased from eight to nine and a half for a day's work. For nearly five years eight hours has constituted a day's work.

The building for J. M. Wilson's new boiler works, Chattanooga, Tenn., is nearly completed.

The addition to the rolling mill of Potts Bros. Iron Company, at Pottstown, Pa., will be about 140 by 40 feet.

Tucker & Cook, of Conway, Mass., have let the job of rebuilding their new factory to an Athol (Mass.) man, he having underbid all others some $600. The building is to be completed this fall.

The Brooks Locomotive works in Dunkirk, N. Y., are at work on 18 locomotives, which must delivered by October 1. The Baldwin works have orders for 38.

The Hamilton Co., Lowell, Mass., is putting in the foundation for a big mill, 365 by 75 ft., six stories, with ell, 75 by 75 ft., same height. It will embrace under its roof about all the processes of manufacture, from picking cotton to weaving cloth. It is expected to build the mill next season.

D. Saunders' Sons, Yonkers, N. Y., have sold, through their agencies, 60 of their IXL Pipe Cutting and Threading Machines, cutting from ⅛ to 2 inches, since first placing them upon the market four months ago.

Bradley and Co., Syracuse, N. Y., writes us recently: "We are running our works on full time, and find a rapidly increasing inquiry for our manufactures, having shipped 12 of our various sizes of cushioned helve hammers within the last thirty days."

The Indianapolis Rolling Mill advanced the wages of its employees 10 per cent. from September 1st.

Engineers' and Machinists' Supplies.

The features of the market are buoyancy and a disposition to quote prices only for immediate orders. There is likely to be an important advance in set screws before many days. Most of the machine screw makers are refusing large orders for future delivery. H. S. Manning & Co., 111 Liberty St., city, agents for Hoopes & Townsend, are sending out announcements to their customers withdrawing all quotations on nuts, bolts, washers, lay screws and rivets. The advance in boxwood and ivory rules, noted in our last, is fifteen per cent. A combination is forming to advance the price of Stub's files and tools about ten per cent. The Rue Mfg. Co., 523 Cherry St., Philadelphia, are making important changes in the classification and capacities of their Little Giant Injectors.

We are pleased to notice that S. E. Adamson, typographic engraver and steel punch cutter (formerly of Johnson Type Foundry), has resumed his original vocation at No. 9 Murray St., New York. His work is distinguished for character and originality. To engrave or cut a good steel punch or steel stamp, whether to be used for making a matrix for type, or for any other purpose, requires a particular kind of mechanical skill in order to do it well, and Mr. A. is certainly one of the best in the profession. A first-class steel letter or stamp will give a satisfaction like the possession of a choice work of art not designed for utility. Mr. A. has large experience in making steel letters and steel stamps by hand, and executing mechanical engraving on metal patterns for casting in sand.

Situation Wanted—Help Wanted.

We will publish notices suitable for the above headings, applying to any of the machinery trades, and not to exceed four lines each (32 words), at the nominal rate of twenty-five cents for each insertion.

WANTED.—A place is desired by a man of experience and with good references, in charge of experimental machinery. Parties having machines to develop, or under way, are invited to correspond or talk with WILLIAM A. LORENZ,
363 Macon St., Brooklyn, N. Y.

WANTED.—Position as Stationary Engineer, by one having several years' experience in a chemical works. Refers to last employers. Address, care office AMERICAN MACHINIST, D. J. H.

NOTICE to Builders of Stationary and Portable Steam Engines, Machinists' Tools, Sugar Plantation Machinery, Pumps &c., &c., a situation as superintendent or foreman. Address for two weeks, P. D. Box 340 Beverly, Mass.

USEFUL BOOKS
FOR
PRACTICAL MEN.
DESCRIPTIVE CATALOGUE FREE.
E. & F. N. SPON, 446 Broome Street, N. Y.

W. H. HOFFMAN,
MECHANICAL ENGINEER,
Designer of the Most Modern and Improved Rope Machinery,
Will, upon application, Superintend Construction of Machinery for Preparation, Spinning,
FORMING AND LAYING.
Machines and Attachments for
LONG ROPES AND HAWSERS,
(For OIL WELLS, Etc.)
N. Y. Office, 42 Cortlandt St., 2nd Floor. Passaic, N. J.

SIZES and PRICES.
VERTICAL.

NAME.	Horse Power.	PRICE.
Mercury	10	$225
Queen	15	250
Monarch	20	300
Vulcan	30	350
HORIZONTAL		
Meteor	10	$200
Reliable	20	250
Hercules	30	325

A NEW DEPARTURE.
VERTICAL AND HORIZONTAL ENGINES AND YACHT ENGINES
OF FROM 10 TO 30 H. P.
At a Reduction of Fifty Per Cent. from Former Prices.
BEST MATERIAL. BEST WORKMANSHIP. LOWEST PRICES.
Manufactured by HEALD, SISCO & CO., Baldwinsville, N. Y.

Send for new Illustrated Circular, giving full description, and convincing testimonials, of which the following is a specimen:

U. S. ENGINEER'S OFFICE,
PITTSBURGH, Pa., July 23, 1879.

Messrs. HEALD, SISCO & Co., Baldwinsville, N. Y.

Gentlemen:—In reply to your letter of the 19th instant, I have to say that we have had one of your "Reliable" horizontal engines at work since the middle of October, 1878, up to the present time. It has been used for driving one of your No. 10 Centrifugal Vertical Pumps, and has given us entire satisfaction. The only repairs necessary has been the replacing of the piston packing once.

Yours truly, T. A. MAHAN,
1st Lieut. Engineers.

[We desire to call particular attention to the above letter, as since it was received by us, Lieut. Mahan has confirmed his good opinion of our Engines therein expressed, by ordering two more of them.]

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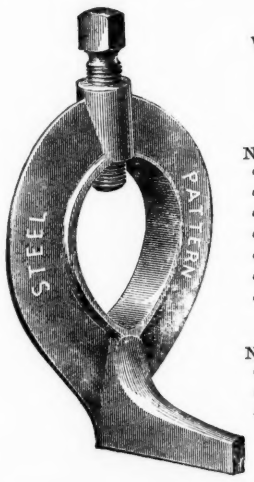

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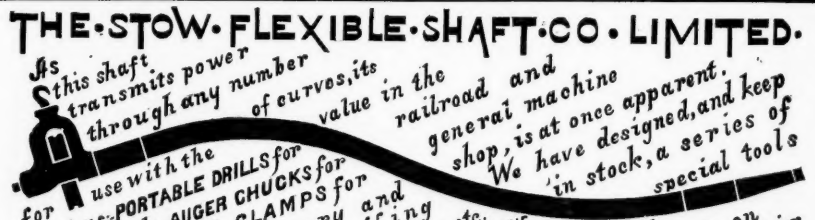
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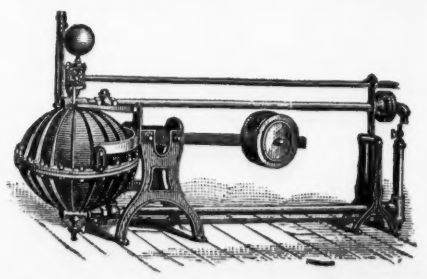

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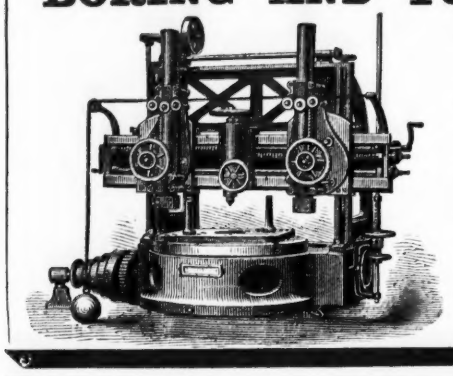

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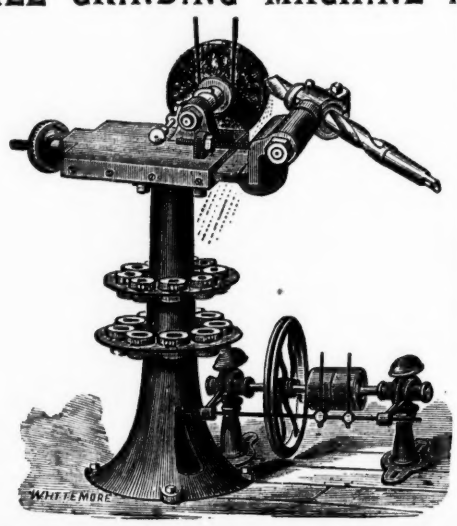

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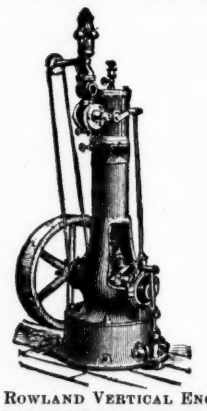

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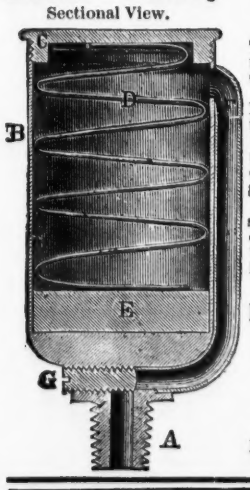

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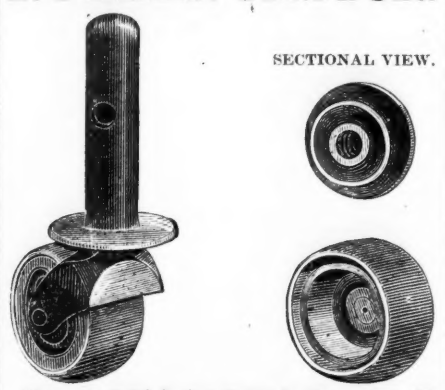

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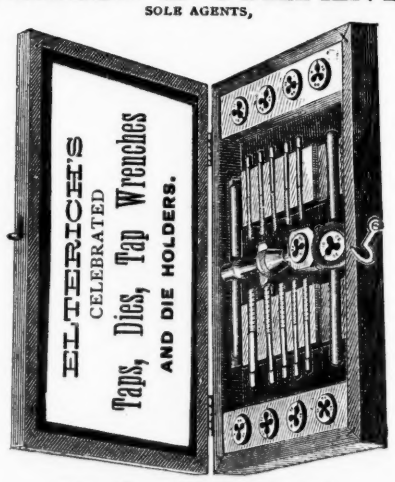

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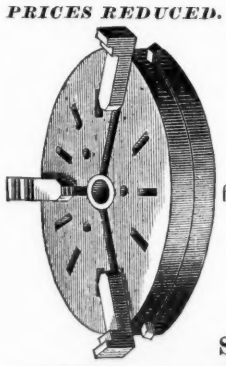

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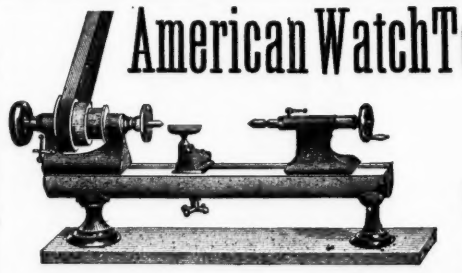

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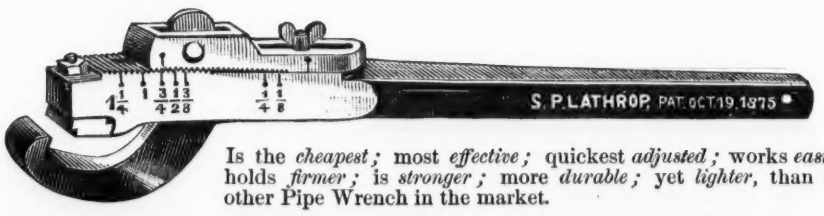

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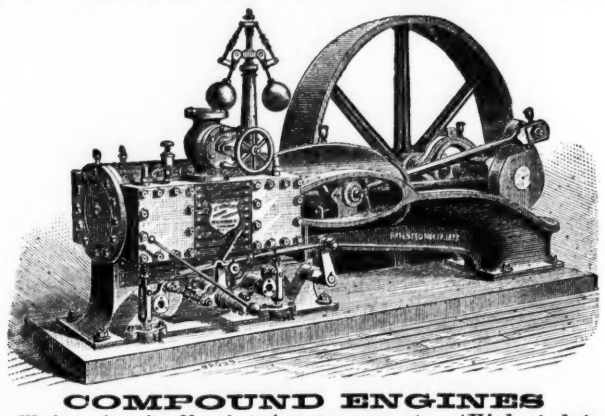

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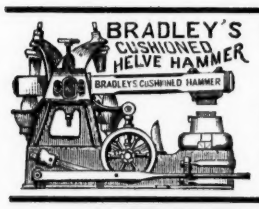

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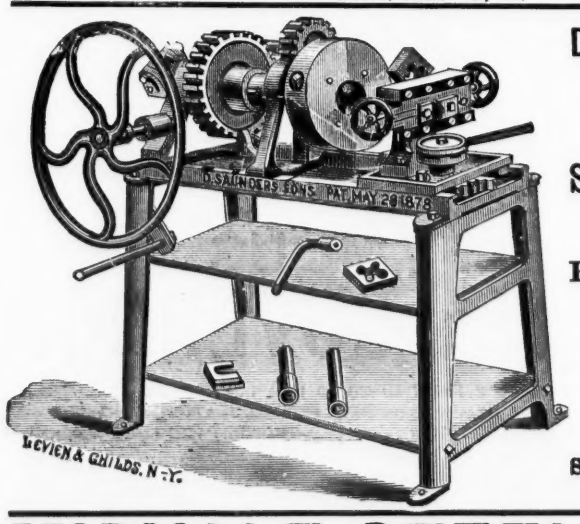

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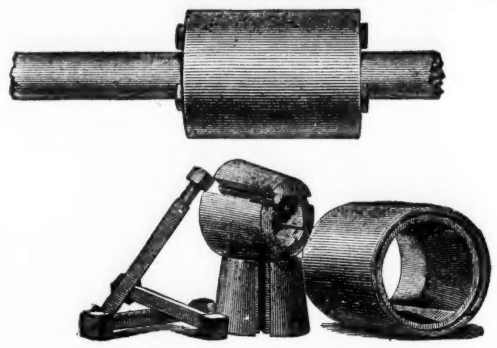

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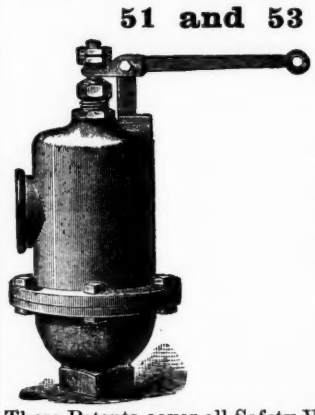

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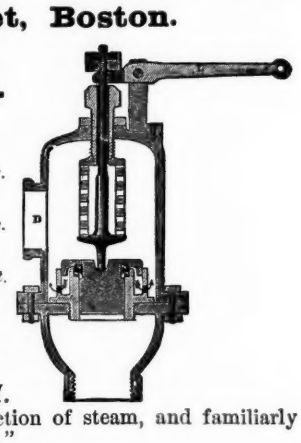

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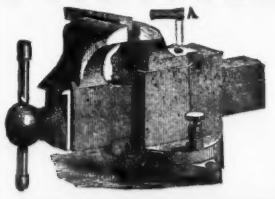

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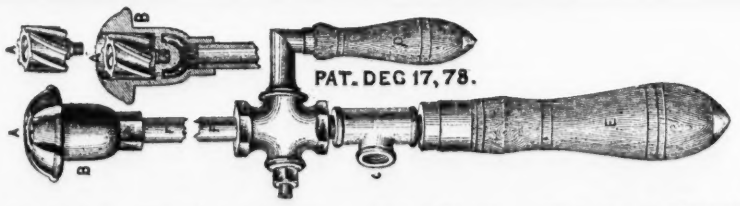

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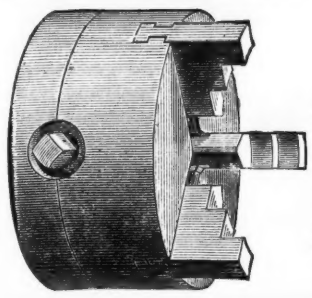

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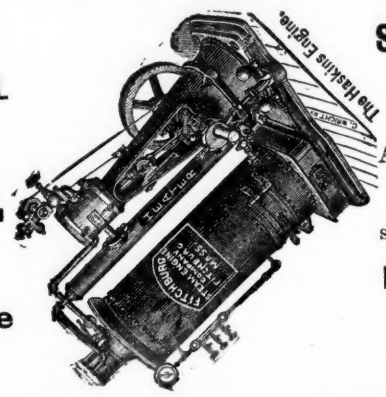

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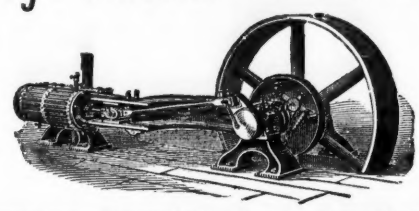

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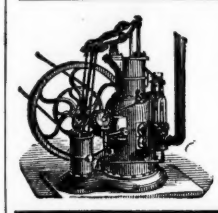

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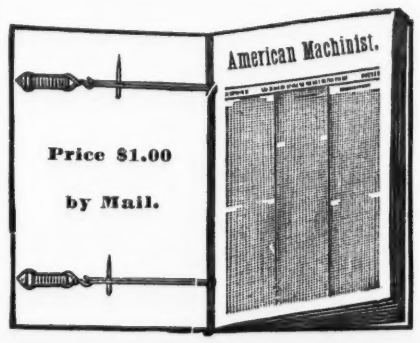

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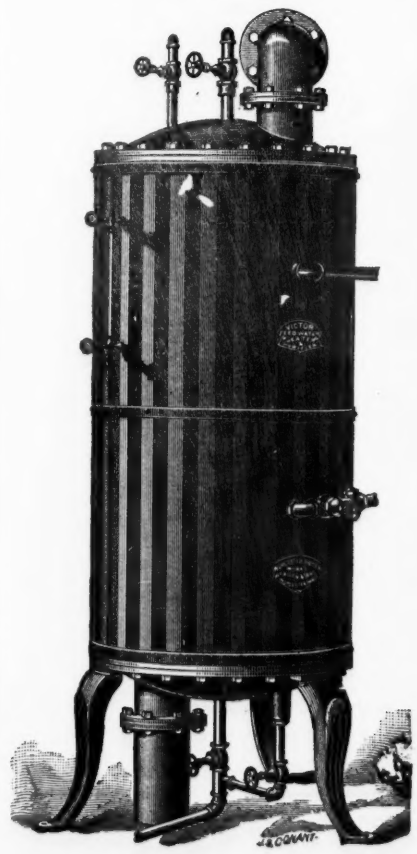

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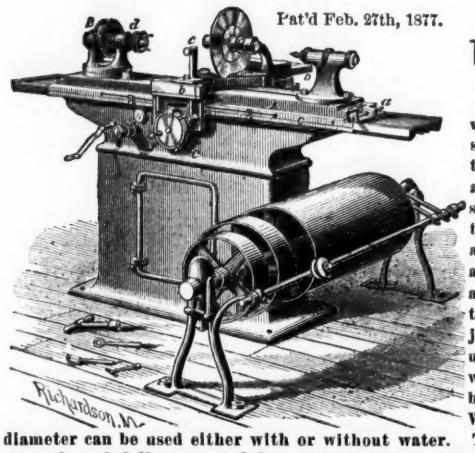

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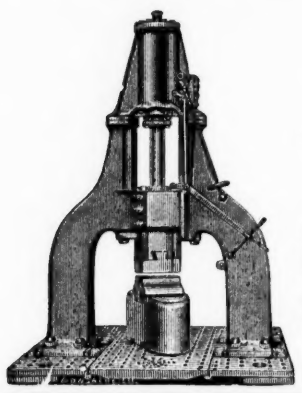

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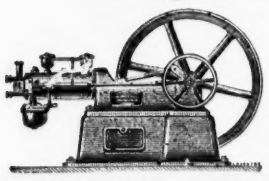

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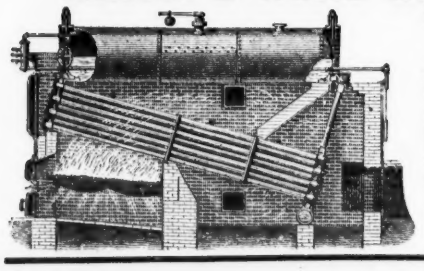

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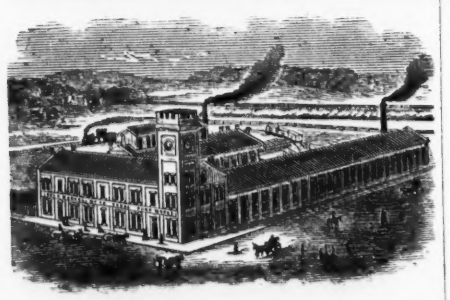

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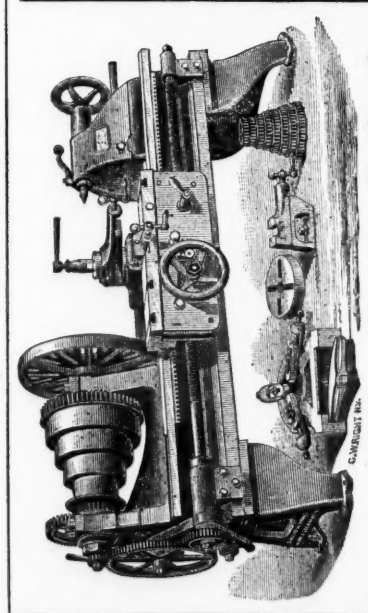

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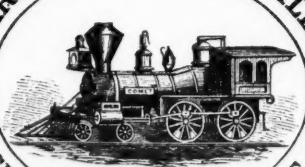

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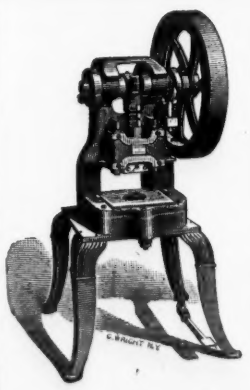

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